

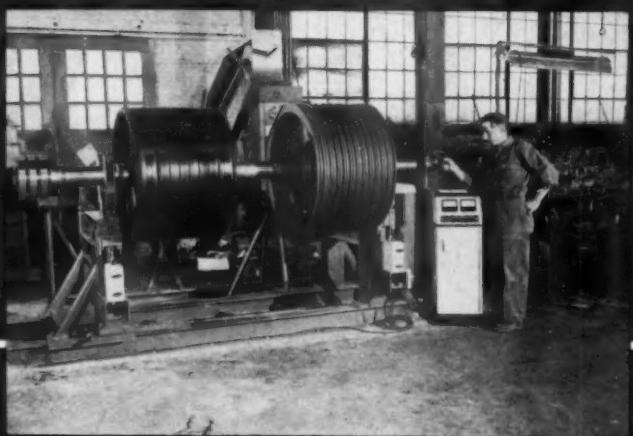
JULY 1955

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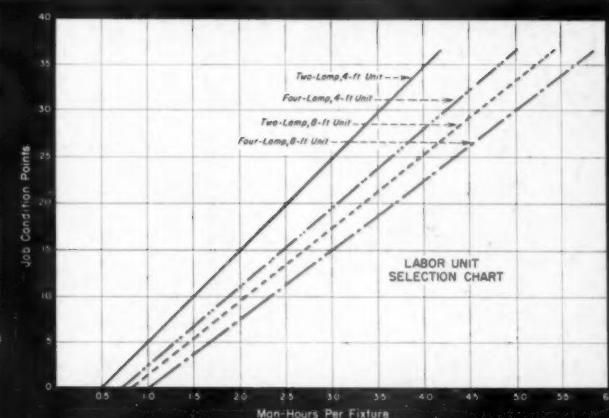
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DYNAMIC BALANCING at Los Angeles Gas & Electric's motor shop will be highlighted at 22nd N.E.C. convention, June 5-16. Page 45



NEW POWER-SAVING CHART method of determining man-hour units for fixture installation

Page 78



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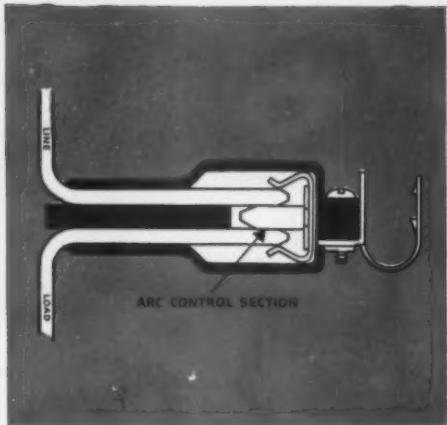
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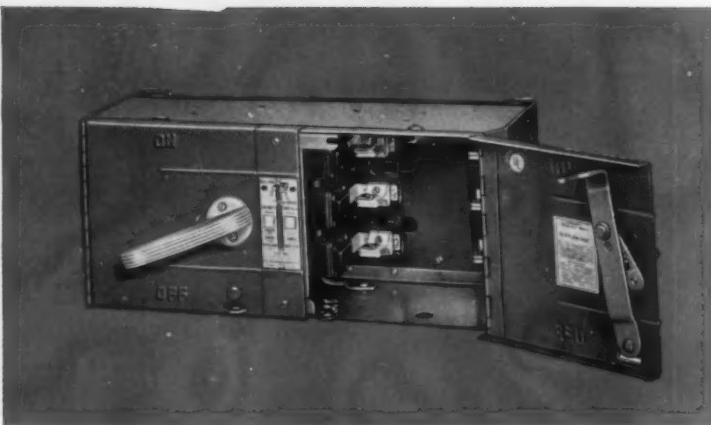
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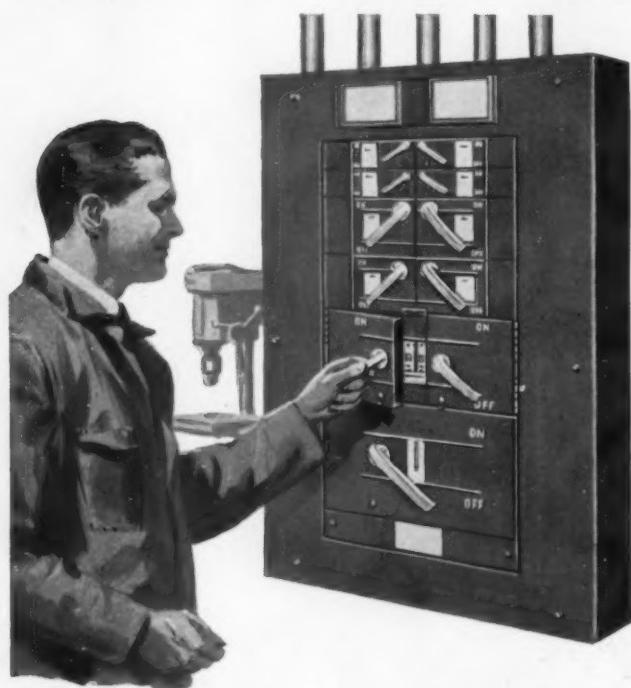
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engineering, installation, repair, maintenance and manage-
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April 1955

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Sidelights

ELECTRICAL SPECIFICATIONS

—The "Master Electrical Specifications", a triennial editorial project, will be featured in the May issue of *Electrical Construction and Maintenance*. Now in its seventh big revision, the Master Electrical Specifications has become a standard guide for the preparation and writing of electrical specifications. The project is unique, not only in its comprehensive description of what should be included in electrical specifications, but in its use of practical specification paragraphs, written in the precise, imperative language of actual specifications.

Good specification writing is needed far beyond the documents issued by architects and engineers. It is essential in inquiries about materials and systems to suppliers, in requests for quotations, in negotiations with subs, in presentations and proposals to owners and their agents, in formalizing changes and extras and a host of other everyday activities in the electrical construction industry.

HI-CYCLE FLUORESCENTS — It looks like hi-cycle fluorescent lighting for buildings is coming out of the laboratory into the commercial arena. One project is nearing completion and others are on the boards. The new method promises to be one of the

more interesting technical developments of the day.

The system operates conventional fluorescent lamps at about 500 cycles with small capacitor ballasts giving an increase of about 20% in lumens-per-watt output and a substantial reduction in fixture weight. Energy is supplied by frequency changers which may be rotary or static.

GRAPHIC UNITS—One of the latent problems in the use of the best of labor units is the chance that consciously or unconsciously the estimator will come to regard them as precise values. Actually any labor unit can be only a typical value in a potentially wide range of possible values.

Modification of labor units to individual company experience and to particular job conditions is usually accomplished by "job factors" or "operators" both of which, unfortunately, call for almost clairvoyant judgment on the part of the estimator.

A new and, we believe, novel method of selecting labor units more precisely applicable to a wide variety of job conditions is presented in "Fluorescent Fixture Hanging" on page 78. Instead of a fixed unit, this method employs a "point selection" chart and a graph.

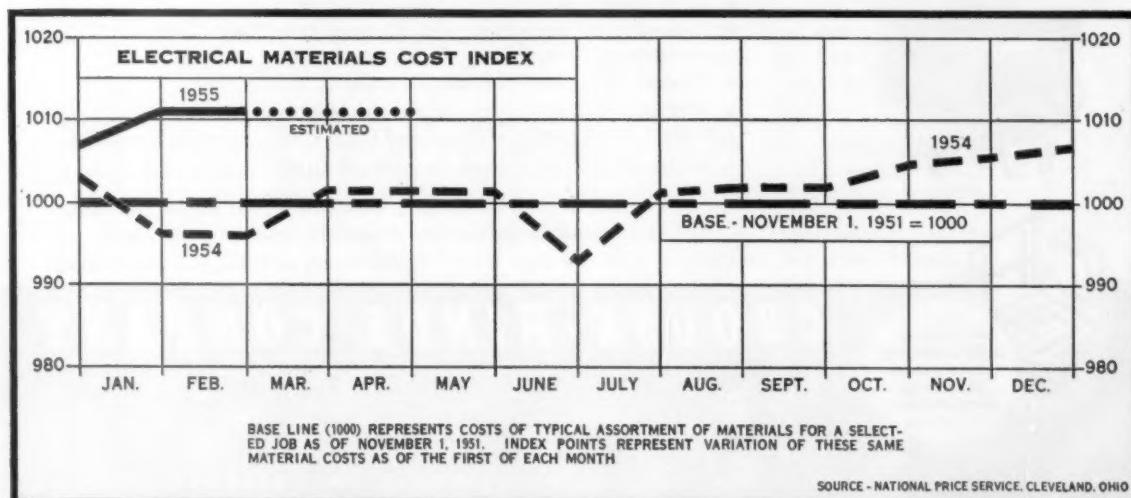
At first glance the "point-selection-

"graphic" method may look cumbersome. But try it! You will find that the "points" can be summed up in seconds and the unit read very easily on the graph.

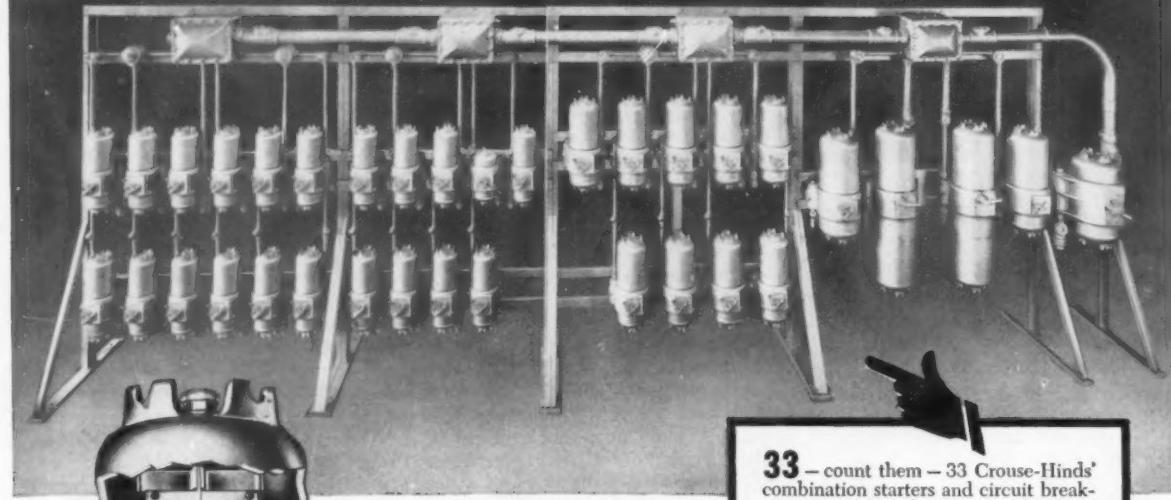
It will be noted 1) that the "point selection" is almost entirely objective and deals with job characteristics which can be accurately pre-determined, and 2) the resulting unit is selected from a wide range of values, a constant reminder that any unit is an approximation.

Comments and suggestions from our readers will be cordially welcomed.

NISA TO LOS ANGELES—Come June, members of the National Electrical Service Association will be heading for their 22nd annual convention at the Hotel Statler in Los Angeles, June 6-10. In addition to a fine meetings program, delegates will find a cordial welcome from member shops in and around Los Angeles. To give you a preview of some of the shops and shop methods to be found in the area we were able to obtain the able help of Horace Barks, editor of *NISA News*, who, with the cordial cooperation of the members, produced the photographs and captions for our lead feature this month, "Southwest Shops to Welcome NISA", beginning on page 65.



*Need more motor controls
BUT... haven't enough room?*

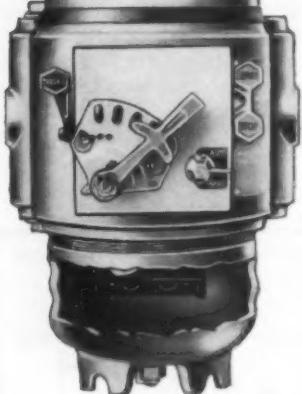


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Washington Report

New uncertainty over the economic and political outlook increases as Washington sees a growing possibility of U. S. military involvement in the Formosa strait area. Such involvement, if any, would be small scale, it is felt. But aside from the Formosa question, Washington mobilization officials are set with war plans extending from strategic plans of the military to proposed economic controls on materials, prices, wages and rents. All such plans are on a standby basis. In case of real involvement in Formosa or elsewhere, these ready-made recommendations will be unfolded to Congress—draft plans, economic control plans, arms-building plans. Such eventuality would of course bring about an entirely new outlook for business and the national economy, and should not be overlooked now as you map your own plans for the future.

Business upswing has broadened throughout the economy during the first quarter, concludes the Commerce Department as it reports healthy signs in all phases of the over-all business picture. Particularly encouraging is the outlook for plant and equipment investment this year of \$27 billion, slightly better than 1954, and only about \$1 billion less than the record 1953 volume. Also, sales dollar volume will average 5% more than 1954, and construction will reach the \$39.5 billion goal predicted earlier, the Department of Commerce said.

Industrial production hit highest levels since October 1953 during this year's first quarter, at 135% of the 1947-49 average during February, according to the FRB index. This compared with 126% of the base average a year earlier. Increased production of steel to about 92% of current capacity, of auto production at weekly rate of about 170,000 units reached during February, of household durable goods, of non-electrical machinery, of non-durable goods such as rubber, paper, chemicals and petroleum products, and of minerals brought this about, FRB reported.

Housing starts in February set a new record for that month, with a total of 90,000 starts. This was 20% above same month a year earlier, and topped previous 1950 February record of 82,900 starts.

Total new construction in February was valued at \$2.6 billion, also a record for the month and 12% ahead of February 1954. Expenditures of \$5.4 billion in first two months of this year were 13% ahead of last year.

Electricity output is running about 16% ahead of 1954, or 185% of the 1947-49 average. Actual output is at weekly rate of about 9.9 billion kilowatt hours, but has exceeded the 10 billion kwhr per week rate mark earlier in the year for the first time in history.

Cost-of-Living has stabilized at about 115% of the 1947-49 base of 100, BLS reports. The index in January was 114.3, and fluctuations over the past 18 months had ranged mostly between 114 and 115 which reflects a sustained high level of economy and a general picture of business stability.

Unemployment is on the down-grade, Labor Department reports. New claims for unemployment pay by jobless reached the lowest point in March since October 1953, BLS said, as idle workers receiving state jobless pay dropped to 1,796,500.

Consumer credit eased off in January from its all-time peak of last December by \$441 million to \$29.7 billion, FRB reported. It was still \$960 million greater than a year earlier, and is considered a danger signal by some economists outside government who point out that the rate of personal savings is slowing down, home mortgage foreclosures are on the rise, and life-insurance cashins are at a faster rate than previously.

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ELECTRICAL CONSTRUCTION AND MAINTENANCE . . . APRIL, 1955

FINANCIAL AID TO HIGHER EDUCATION

Our Colleges and Universities Are Living on Borrowed Time

. . . time borrowed from underpaid faculty members

The chart on this page tells a story of profound importance to every American. It is the story of the financial beating our college and university faculty members have been taking in the past 14 war and postwar years.

On the whole, this span of 14 years has been one of great and growing prosperity. But, as the chart shows, our college and university faculty members have, as a group, had less than no share in it.

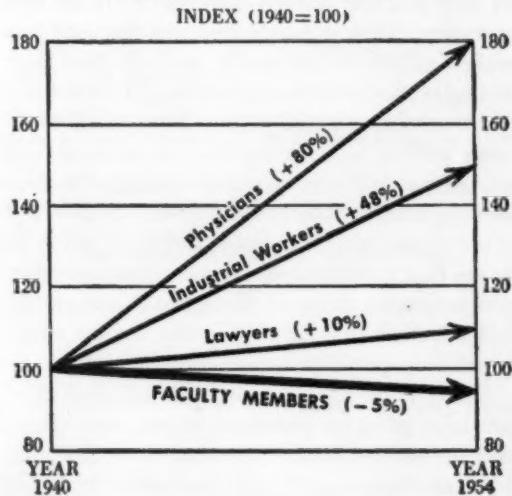
During this period, from 1940 through 1954, the real income of the average industrial worker (that is, what his wages would purchase in goods and services) has increased by almost one-half. Among professional groups, physicians have enjoyed an increase of about 80 per cent in their real income. Lawyers, far less favored financially, have had an increase of about 10 per cent. But faculty members have not only had no increase at all; over these years of prosperity their average real income has fallen by 5 per cent. These figures do not take account of the increase in taxes since 1940.

Senior Teachers Hardest Hit

These figures are, of course, averages. For some groups of faculty members it has been better; for others worse. It has been particularly

hard on senior faculty members. Between 1941 and 1953 their salaries lost about 8 per cent of their purchasing power. Being deeply committed to their careers they could not respond to alternative employment opportunities as readily as could their junior colleagues. For junior faculty members there was some increase in real income between 1941 and 1953 but only about half as much as the average for the nation.

What's Happened to College Faculty Salaries*



* Real Income before Taxes

Source: Council for Financial Aid to Education; U. S. Dep't of Commerce; U. S. Dep't of Labor.

Public Colleges Fare Better

There are also marked differences in the average financial reward received by faculty members in different types of colleges and universities. A recent study by the Council for Financial Aid to Education indicates that, in the last academic year, 1953-1954, teachers in privately endowed, independent colleges and universities were paid an average salary about \$1000 less than that paid to faculty members in tax-supported institutions. The same study indicates that salaries far below the average are especially common for faculty members in the small private liberal arts colleges. This study found that during the last academic year the average salary of all college and university faculty members was about \$4700.

The special difficulties under which the independent colleges and universities, and particularly the independent liberal arts colleges, are laboring to get back on their feet financially have been discussed in previous editorials in this series. These difficulties underline the need of special help for these institutions to which business firms are now contributing in increasing volume. However, the problem of providing better salaries is not peculiar to any particular type of institution.

Faculty Members Not Greedy

It is not easy to prescribe a precise standard of fair pay for college and university faculty members. This is partly because they put less weight relatively on money rewards than they put on rewards of scholarly accomplishment and prestige. Consequently, they have consistently been willing to work for very modest salaries in relation to the intellectual ability, education and application required. Obviously, however, it is the dictate both of fairness and good judgment to see that faculty members are given a roughly proportionate share in the general prosperity. Indeed, their crucial role in our society could be made to justify a larger share than this.

There is no way to know with any degree of precision what the underpayment of our college and university faculty members over the past 14 years has actually cost the nation in terms of reduced quality of intellectual performance of those institutions. One reason is that the damage has been minimized by the devoted services

of many faculty members who have loyalty stuck to their jobs in spite of the great financial discouragement.

It is obvious, however, that, if no grave deterioration in the intellectual performance of our colleges and universities has occurred so far, it is because we have been living on borrowed time. It is time borrowed from faculty members who have, in effect, been subsidizing these institutions by their financial sacrifice. This arrangement is not only a menace to the cultural and intellectual life of the nation, it is also a menace to our national security in a time when successful national survival may well depend in peculiar degree on the full development and utilization of our intellectual resources. We depend on our college and university faculties pre-eminently to provide this development. Adequate financial reward for such service is an elementary form of national insurance.

Many of our colleges and universities are working hard to improve the financial lot of their faculty members. Business firms are also playing an increasing role of providing the necessary financial assistance. The methods being used by business for this purpose will be the subject of another editorial in this series. However, vastly more must be done, and quickly, to stop the financial beating being taken by our college and university faculty members if the nation's welfare and safety are to be properly protected.

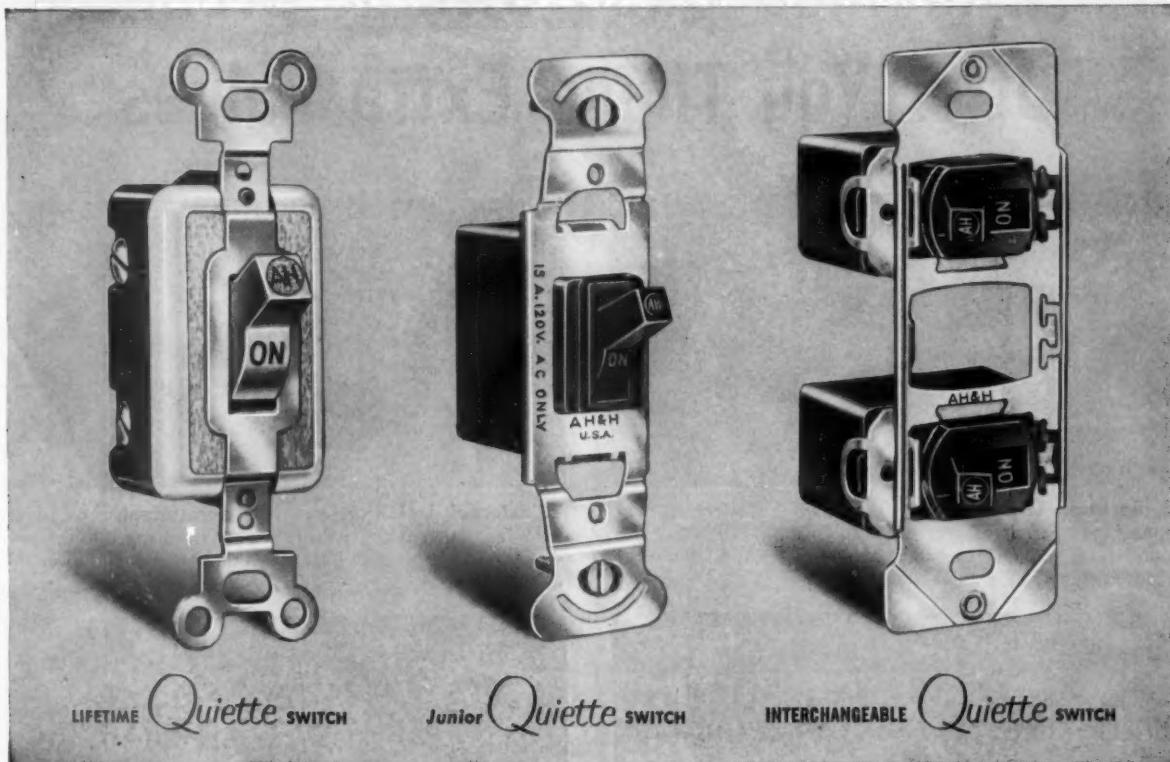
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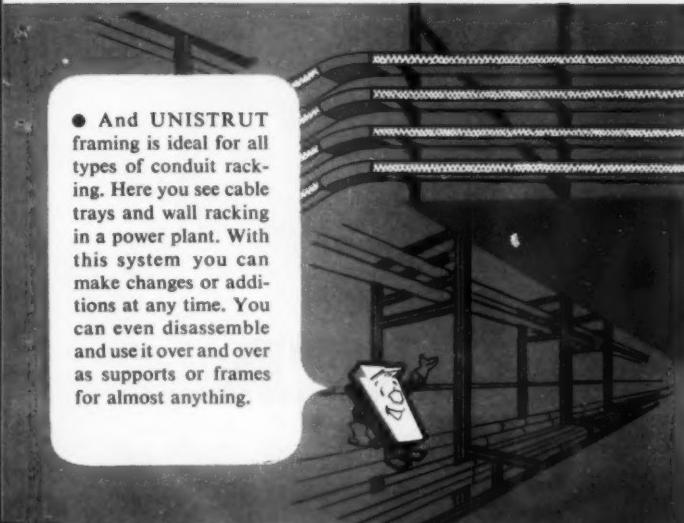


Mr. Strut shows way to save space, money on conduit racking with UNISTRUT® framing

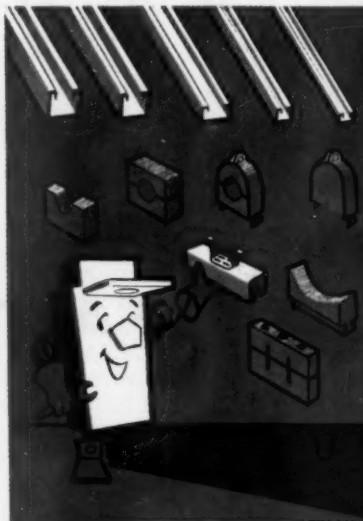
- This conduit installation was recently done in an industrial plant with UNISTRUT framing. It was a complicated task to arrange the many different lines, but UNISTRUT framing did it fast and kept costs low. This is how it was done—



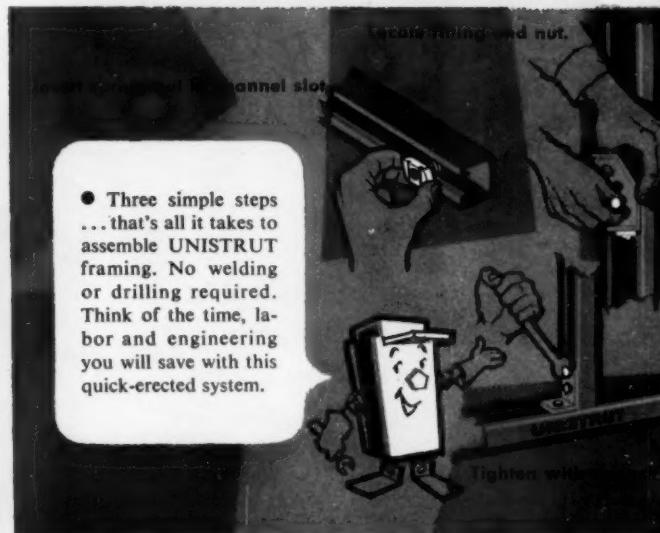
- Here you see how the concrete insert makes installation easy and fast. It provides a fastening point all along its length. Fittings can be attached quickly and adjustments made while work progresses. Everything bolts together. Much easier than welding!



- And UNISTRUT framing is ideal for all types of conduit racking. Here you see cable trays and wall racking in a power plant. With this system you can make changes or additions at any time. You can even disassemble and use it over and over as supports or frames for almost anything.



- UNISTRUT framing reduced installation time because everything needed—channels, clamps, insulators, fittings, concrete inserts—are part of the complete UNISTRUT system. No special fabrication needed.



Get acquainted with UNISTRUT framing for your next job. Your UNISTRUT Distributor can be of great assistance in the use and application of UNISTRUT framing for conduit racking. See him, too, for the many other uses of this versatile metal framing system. And be sure to ask about our new low prices!

Mail the coupon below or contact your UNISTRUT Distributor for free catalogs and information on our new idea-packed film: "The Sky's The Limit." Complete warehouse stocks in all principal cities. In Canada, Northern Electric Company.

The World's Most Flexible All-Purpose Metal Framing



UNISTRUT PRODUCTS COMPANY
1013 W. Washington Blvd.
Chicago 7, Illinois

Dept. E-4

- mechanical and electrical catalog No. 700
 information on UNISTRUT film, "The Sky's The Limit."

Name.....

Address.....

Company.....

City.....

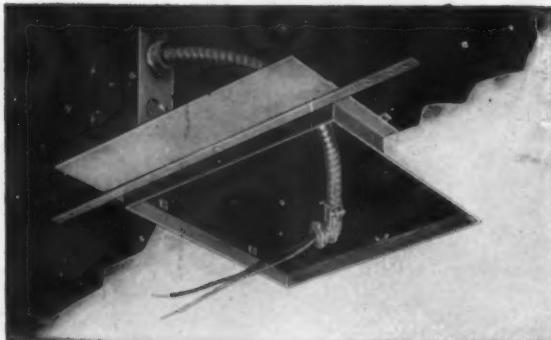
Zone..... State.....

U. S. Patent
Numbers
2327967 2360370
2327915 2365531
2345680 2361980
2063382 2361130
Other patents pending

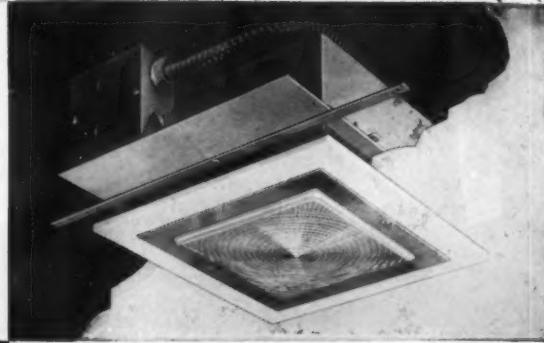
ART METAL

makes your wiring

EASIER *and* FASTER



The Binary Plaster Frame of Art Metal units has complete installation equipment including attached junction box, wire, Greenfield and two mounting rails.



Complete specifications on Art Metal pre-wired plaster frame and lens boxes are found in Bulletin 254. We suggest you write for this bulletin . . . it'll show you how to save installation time and money on your next job!

Art Metal recessed lens box housings are easily installed as the job nears completion. Vertical slotted mounting holes provide adjustment for ceiling thickness from $\frac{1}{2}$ " to 2".

THE **ART METAL** COMPANY

CLEVELAND 3, OHIO

Why You Should

Modernize Electrically

VOltage drop costs you money . . . in torque losses, lighting losses, and production losses. The cause is usually an outmoded or overloaded plant electrical system. Correcting low voltages is easy with Allis-Chalmers unit substations; and, in addition to eliminating these losses, you get new flexibility in plant arrangement that usually pays extra dividends.

Get Your Full Value. You save because *full* power is distributed from the center of load — voltage drop and conductor losses are kept to a minimum. Expensive secondary lines to equipment are kept short and flexible — changes are easily made.

Save Space. Compact, flexible Allis-Chalmers unit substations fit anywhere. Put them in production areas on balconies, in the basement, on the

roof, or outside the building. Entirely metal-enclosed, they may be located with complete safety — no enclosures are required.

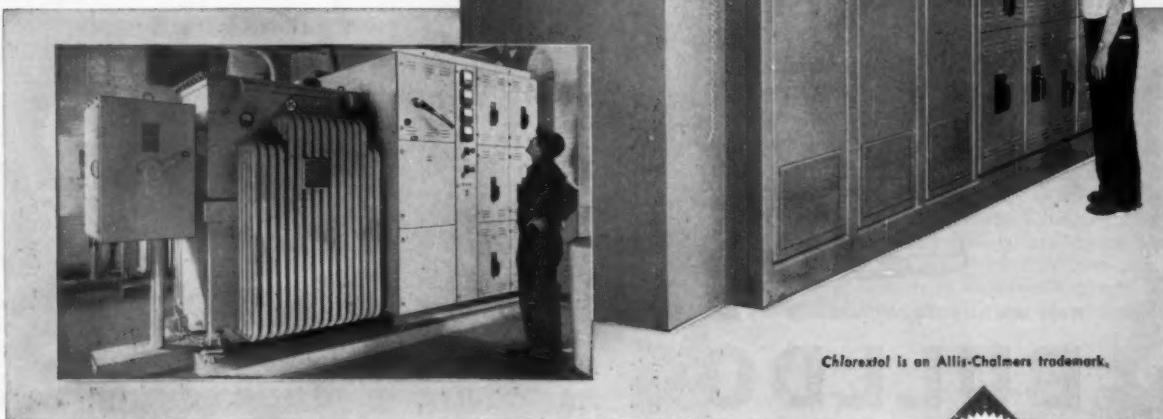
Let experienced Allis-Chalmers substation engineers help you solve distribution problems. Call your nearby Allis-Chalmers district office, or write Allis-Chalmers Mfg. Co., Milwaukee 1, Wisconsin, for your copy of "Power at Load Centers Pays Off" (11B6285B).

A-4604

ALLIS-CHALMERS
UNIT
SUBSTATIONS

For your unit substation

Allis-Chalmers offers you four basic types of transformers: ventilated dry-type, Chlorextol-liquid filled, sealed dry-type, and oil-filled transformers. Low voltage equipment can be either manually or electrically operated air circuit breakers. High voltage switches can either be liquid filled or air break type.

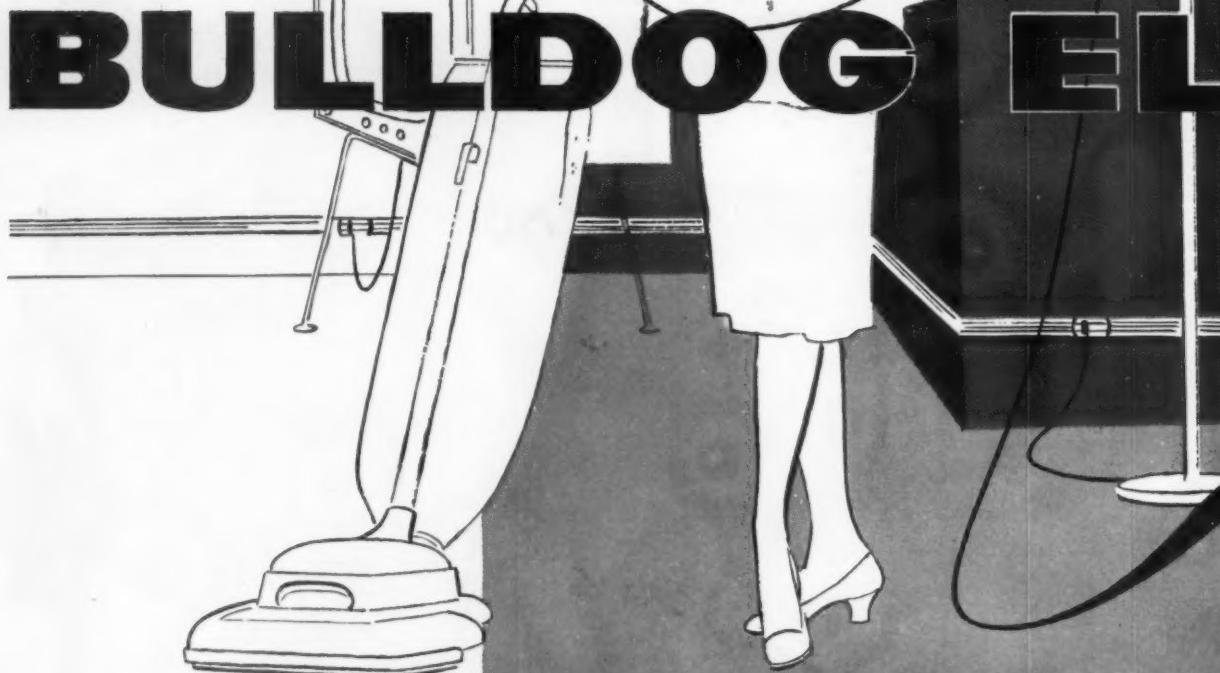


Chlorextol is an Allis-Chalmers trademark.

ALLIS-CHALMERS



It's here!
A new,
exclusive way
to provide
movable
electric outlets!



IF IT'S NEW . . . IF IT'S DIFFERENT . . . IF IT'S BETTER . . . IT'S

BULLDOG ELECTRIC PRODUCTS COMPANY

A Division of I-T-E Circuit Breaker Company

Export Division: 13 East 40th Street, New York 16, New York. In Canada: Bulldog Electric Products Company (Canada), Ltd., 80 Clayton Road, Toronto 15, Ontario.



SIMPLE—Electrostrip mounts easily on walls, moldings, anywhere . . . handforms to fit any contour. It's neat, attractive in its natural ivory color to harmonize with any decorative scheme.

CONVENIENT—Outlet receptacles clamp into the strip wherever you want them . . . lock securely in place. No more poorly located fixed outlets. You can move receptacles in seconds with ease.

SAFE—Electrostrip does away with long extension cords, thus eliminating the danger of fire. Receptacles can be individually fused. It's 100 per cent safe. Listed by Underwriters' Laboratories.

ELECTROSTRIP

Every inch an outlet!

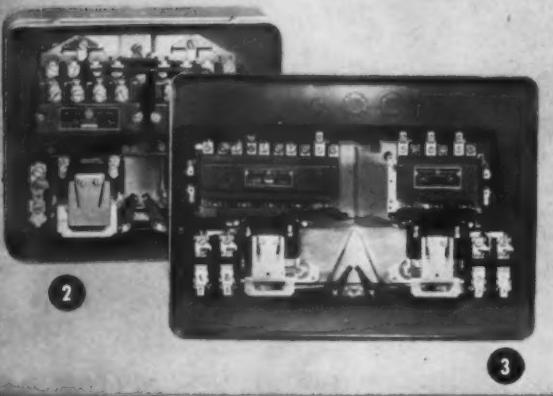
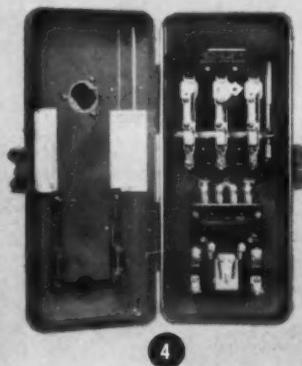
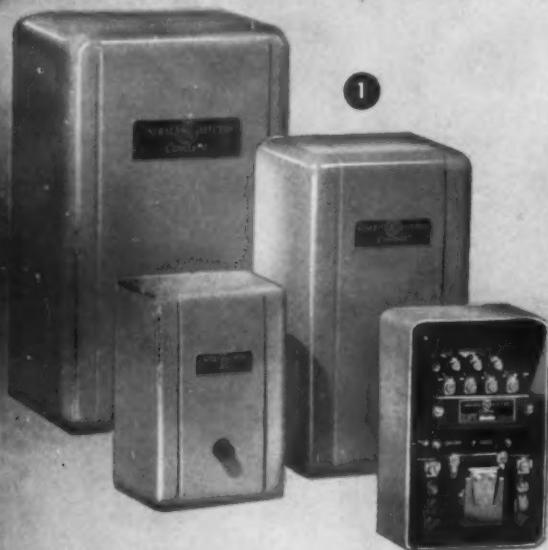
Here's an amazingly easy and profitable way to modernize electrical wiring . . . provide electrical outlets that move as you move furniture, change lighting arrangements or shift office layouts. Install safe, new BullDog Electrostrip®—the modern electric wiring that provides an outlet every inch along its length.

Homes, hotels, businesses and institutions need and are demanding this most advanced electric outlet system. It does away entirely with the inconvenience of fixed wall outlets in hard-to-reach places, and the hazards of unsafe, unsightly extension cords. This means more business—more profit—for you!

BullDog Electrostrip is *installed only by qualified electricians*. No special installation tools or techniques are required. Available in convenient roll-strip form. See your nearest qualified distributor, or write BullDog Electric Products Company, Detroit 32, Michigan, for full details.

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General Electric—one source of supply



MAGNETIC CONTACTORS AND STARTERS

Select from a full line of open and enclosed devices—from fractional hp through 200 hp (600 volts, maximum). Available in every popular NEMA enclosure, including: general-purpose; semi-dust-tight; watertight; dust-tight; explosion-proof; oil-immersed, corrosion-resistant; and JIC (automotive).

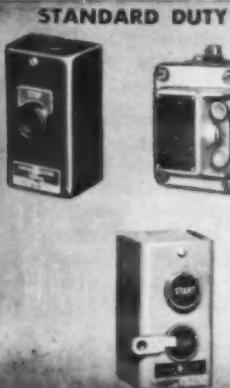
COMPLETE LINE OF MODIFICATIONS is offered on magnetic starters such as: push button or selector switch in cover, extra interlocks, third pole overload relays, separate a-c control circuit, and extra control relays.

1. **FULL-VOLTAGE MAGNETIC STARTERS** (CR7006) for squirrel-cage induction motors are available in size 00 to size 5 with bi-metallic overload protection.
2. **REVERSING CONTROLLER** (CR7009) combines two standard magnetic starters and mechanical interlock.
3. **MULTI-SPEED CONTROLLER** (CR7107) is ideal for full-voltage starting of 2-, 3-, or 4-speed squirrel-cage motors.
4. **COMBINATION STARTERS** (CR7008) provide disconnecting means and short-circuit protection by nonfusible or fusible disconnect, or circuit breaker.
5. **CONTACTORS AND MULTI-CIRCUIT CONTROL RELAYS** (CR2810 and CR2820) will handle loads from 5 to 240 amps.

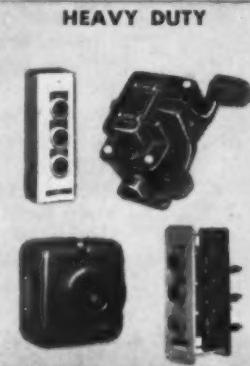
PUSH BUTTONS, SELECTOR SWITCHES, INDICATING LIGHTS

STANDARD-DUTY PUSH-BUTTON STATIONS

(CR2943). Stations are available with 1, 2, or 3 buttons and in pendant form. Double-break silver contacts assure reliable operation. Units are back-mounted on cover and need not be removed for wiring.



HEAVY DUTY



HEAVY-DUTY PUSH-BUTTON STATIONS

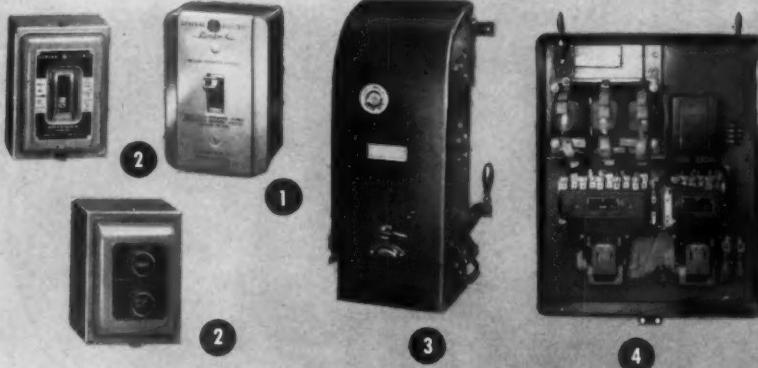
(CR2940). Stations offer wide variety of 1- to 6-unit combinations of push buttons, selector switches, and indicating lights. Also furnished for flush mounting. Palm-, foot- and treadle-operated stations available.

OIL-TIGHT PUSH-BUTTON UNITS AND STATIONS

(CR2940). Units have building-block design permitting any combination of contact arrangements. Also available are indicating lights and selector switches. Enclosures accommodate 1 to 16 units.



for all your general-purpose control



MANUAL AND REDUCED VOLTAGE STARTERS

- 1. FRACTIONAL HORSEPOWER MANUAL STARTERS** (CR1061) are small-size, across-the-line starters operated by toggle switch—includes accurate bi-metallic overload protection.
- 2. MANUAL STARTER UP TO 7½ HP** (CR1062) has snap-action toggle switch or push-button operator which trips free on overload. Available in 2-, 3-, or 4-pole forms.
- 3. MANUAL REDUCED-VOLTAGE STARTERS** (CR1034) are autotransformer types used where reduced starting currents or limited starting torques are needed. Undervoltage protection prevents automatic restart in event of power failure.
- 4. MAGNETIC REDUCED-VOLTAGE STARTERS** (CR7051, CR7056) are autotransformer or resistor types designed for remote or automatic reduced-voltage starting. Timing relay provides proper timing for step-starting, eliminating excessive motor inrush currents.



For more information on any of these general-purpose controls, contact your nearest G-E Apparatus Sales Office, or distributor.

LIMIT SWITCHES

LEVER OR ROTATING TYPE

Double Circuit Lever Type

(CR9440D). Snap action contacts can be changed from normally open to normally closed or vice versa. In open or oil-proof enclosed forms.



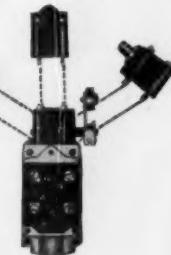
Snap-Action Lever Type

(CR9440J). Used for heavy make-and-break requirements. Forms are available adjustable through 360 degrees. Operating lever firmly attached to shaft by double set of splines.



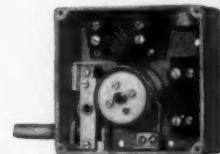
Small Snap-Action Oil-Tight

(CR9440K). Only 1 1/4 and 1 1/2 by 4 1/2 inches. Oil-proof switch has 4 interchangeable heads that can face in any of four directions.



Rotating Cam Type

(CR9441E) Two snap-action contact units operated through a worm gear reduction. Operating cams are easily set by adjusting only two screws.



COMPLETELY NEW CATALOG OF G-E GENERAL-PURPOSE CONTROL

Advertising and Sales Promotion Section J734-1
General Purpose Control Dept.
General Electric Company
Bloomington, Illinois

Please rush me a free copy of the new general-purpose control catalog, GEC-1260A.

Name _____
Title _____
Company _____
Address _____
City _____ State _____

GENERAL  **ELECTRIC**



Instruments for Productive Maintenance



USE THIS VERSATILE



SCREW-IN VOLTAGE LEADS give more protection to operator during actual tests. Voltage terminals are recessed into case for further added protection to operator.

ACTUAL SIZE of G-E hook-on instrument shows large, straight scale for easy reading and accurate checking of electrical quantities. You can see how much easier it is to read this single scale than one with multiple markings on a single face. Contact your nearest General Electric Distributor or Apparatus Sales Office for complete details or clip and send coupon at the right.

G-E Hook-on Volt-ammeter Shows One Scale at a Time; Cuts Down Reading Errors

G-E Instrument Features Eight Scale Ranges for Easier, More Accurate Current and Voltage Measurements

General Electric's hook-on volt-ammeter shows only one scale at a time. You simply select the desired range and only the corresponding scale is visible. This eliminates the possibility of reading the wrong scale, as can be done with multiple scale face instruments. The range and scale of this G-E instrument are changed simultaneously by turning the finger-tip control knob. The two models of the instrument are designated types AK-4 and AK-5, and both have current scales marked in black and voltage scales marked in red.

USED BY contractors, electricians, engineers, main-

tenance and servicemen, the G-E hook-on is ideal for balancing circuits, tracing faults and grounds, or diagnosing operating troubles . . . without shutting down equipment.

WIDE RANGES are available in both models of the G-E volt-ammeter. Ranges of the AK-4 model are 0-10/30/100/300/800 amperes and 0-150/300/750 volts. The AK-5 ranges are 0-5/20/80/350 amperes and 0-150/300/750 volts. In addition to the wider range on the AK-4 model, you also have a pointer-stop to check surge readings.

G-E HOOK-ON TO CUT MAINTENANCE TIME AND COSTS



HOOK IS EASILY OPENED by squeezing contoured trigger. Insulation covering reduces possibility of grounding or short circuiting, giving added safety to operator.

LOW PRICE, \$66.74* for AK-4, \$53.73* for AK-5, includes leather case and 3½-foot screw-in leads. Shock-resistant design helps protect instrument in normal use. Alligator clips hold fast to line.

SECTION A582-6 GENERAL ELECTRIC COMPANY SCHENECTADY 5, NEW YORK

Please send me a copy of the bulletin(s) checked below:

- GEA-6292 AK Hook-on Volt-ammeters
 GEA-5469 Buyer's Guide for Testing Instruments

Name _____

Company _____

Street _____

City _____ Zone _____ State _____

COMPLETE INFORMATION is available on the G-E hook-on line of testers in the free bulletins offered above. Clip the coupon and mail your request now.

*Manufacturer's suggested resale price.

Progress Is Our Most Important Product

GENERAL  ELECTRIC

Those who really know say:

CERTIFIED BALLASTS



give best results!

- No one knows better the value of CERTIFIED CBM BALLASTS than the manufacturers of fluorescent tubes. For the satisfactory performance of their lamps is vitally dependent on the ballasts that operate them. They know CERTIFIED CBM BALLASTS are Tailored to the Tube.

CHAMPION says:

"Fluorescent lamps are designed to operate at specific electrical values. The use of auxiliary equipment that has been proven to meet these agreed upon standards will assure the user maximum value for his lighting dollar with a minimum of operational failures. Certified Ballasts are inexpensive insurance."

GENERAL ELECTRIC says:

"The life and light output ratings of fluorescent lamps are based on their use with ballasts providing proper operating characteristics. Ballasts that do not provide proper electrical values may substantially reduce either lamp life or light output, or both. Ballasts certified as built to the specifications adopted by the Certified Ballast Manufacturers (CBM) do provide values that meet or exceed minimum requirements. This certification assures the lamp user, without individual testing, that lamps will operate at values close to their ratings."

SYLVANIA says:

"The light and life ratings of fluorescent lamps are based on three hour burning cycles under specified conditions and with ballasts meeting American Standards Association specifications. Ballasts marked with the CBM emblem and certified by Electrical Testing Laboratories, Inc., meet ASA specifications."

WESTINGHOUSE says:

"Use ballasts that are tested and Certified by Electrical Testing Laboratories or ones that are otherwise known to meet the specifications of the lamp manufacturer. These will give best results with Westinghouse fluorescent lamps."

*That's why CERTIFIED CBM BALLASTS
merit the slogan—Tailored to the Tube.*

*Certified CBM Ballasts are built to
assure quiet operation and long
trouble-free life.*



CERTIFIED BALLAST MANUFACTURERS

Makers of Certified Ballasts for Fluorescent Lighting

2116 KEITH BLDG., CLEVELAND 15, OHIO

speed plant operations



Recommend
**MIDGET
SIZE**



**Power
Plugin**

Midget [®] POWERPLUGIN is available in 100 amp., 250 volt feeder capacity for 2, 3 or 4 conductor solid neutral types for equipment requiring connection for $\frac{1}{2}$ to 3 HP, 250 volt motors or less, AC or DC, with standard type fuses and $7\frac{1}{2}$ HP maximum for motors with dual element fuses.

The 2 and 3 conductor types provide 220 volt single phase or three phase power to motors while the 4 conductor type provides single or three phase power for motors and 120 volts for machine illumination.



You can add substantially to the efficiency, economy and flexibility of operations of all new and modernized plants by urging your customers to install Midget [®] POWERPLUGIN — the modern system of power distribution for small equipment — power tools, small machines and motors, return lubricating systems, production benches and machine illumination.

Redesigned to broaden its use through an increase of $66\frac{2}{3}$ percent in its capacity and by closer spacing of outlets, Midget [®] POWERPLUGIN provides "plug in and go" power for virtually every type of small equipment.

It also affords substantial savings by eliminating long lead-ins with a resultant voltage drop, and makes it possible to move machines in and out of production lines without slowing down or delaying operations.

Midget [®] POWERPLUGIN is approved by the Underwriters' Laboratories for label service. It is only $3\frac{1}{2}$ inches wide and 2 inches deep in size and is available in standard 5 and 10 foot lengths with plugin outlets every 12 inches. Additional outlets and special lengths are available on specific order.

Recommend this new and better system of power distribution to all your customers who are interested in maximum efficiency and flexibility of plant operations. Your nearest [®] representative, listed in Sweet's, will be glad to assist you in planning installation of Midget [®] POWERPLUGIN.

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makers of:
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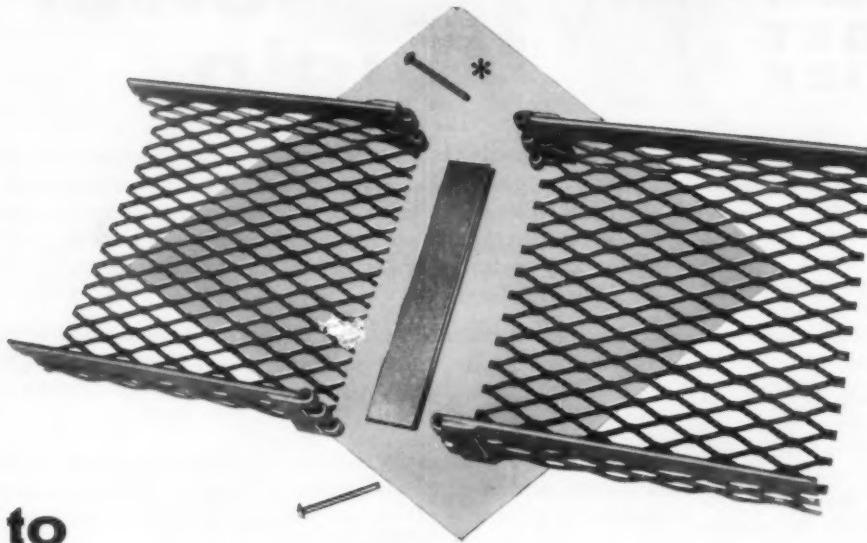


FIRST

the new 70,000 series

COPE CABLE TROUGH

with the built-in coupler



**up to
80% savings in assembly time**

The new 70,000 Series Cope coupler is an integral part of all units. A metal "I" shaped piece is also supplied for each joint to fit between the ends of the mesh and thus eliminate sharp edges. Cope Cable Trough Systems are available in widths of 6", 9", 12", 18" and 24" and in straight lengths of 8', 10' and 12'.

wide range of fittings for each width permits the system to be rapidly assembled on the job site to conform to any plant layout.

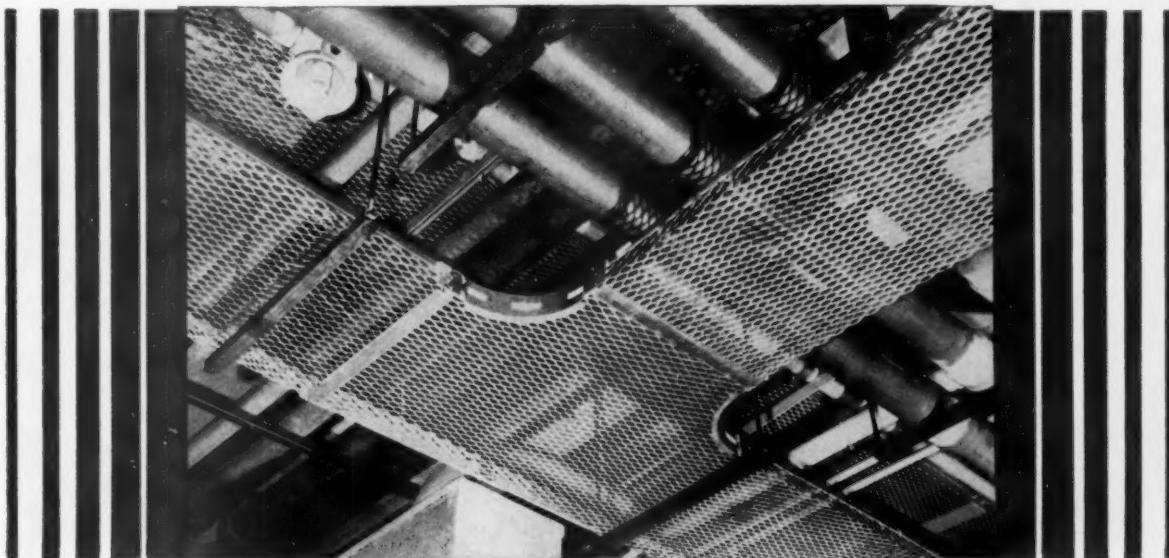
Should field cutting of the trough be required, special bolt-on couplers are available which will join the cut-off end of the trough to the regular pin-type coupler.



T. J. COPE, INC.

711 SOUTH 50th ST., PHILADELPHIA 43, PA.

***PATENT PENDING**



Vineland Municipal Electric Utility • Albert C. Wood Associates, Philadelphia, Pa.—Engineers
Gilbert and Kierstead, Inc., Philadelphia, Pa.—Electrical Contractors

The New 70,000 Series Cope Cable Trough has a built-in coupler... this is typical of the constant efforts of T. J. Cope, Inc., to bring you a stronger and more economical product.

In line with these efforts, Cope pioneered and developed the acceptance of Cope Cable Trough through original design, engineering service and high quality manufacturing standards.

Now Cope has anticipated its many customers' needs for a product which will save up to 80% in erection time

and give still greater strength.

Every straight length and fitting in the versatile Cope Cable Trough system now has a built-in coupler—no more nuts, bolts and washers!

The Cope Representative in your territory will be glad to explain the new coupler and show you samples so that you can have the advantage of this latest Cope development in your next new construction program or plant modernization project.

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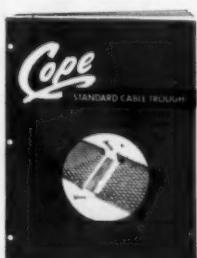
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Write today for
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Bulletin which
illustrates and
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New Cope Cable
Trough with the
built-in coupler.
Ask for Bulletin
M-4.





Lady of Lourdes Hospital, Camden, New Jersey

IN HOSPITALS, TOO, IT'S

"Talk-Don't Walk"

MODERN ARCHITECTURE—
MODERN INTER-COM SYSTEMS

Modern buildings of all types are wired for inter-com sound systems. Efficiency demands "Talk-Don't Walk."

The beautiful new Lady of Lourdes Hospital at Camden, New Jersey, has taken advantage of the permanence and trouble-free performance of Belden Inter-Com Cables for its built-in systems. Specifically, Belden No. 8743 is used for its under-pillow radio receivers.

There is a specialized Belden Cable for every inter-com or sound system requirement.

Belden Manufacturing Co., 4623-A W. Van Buren St., Chicago 44, Ill.

"Talk-Don't Walk"

For Permanent Installations

For Profitable Work

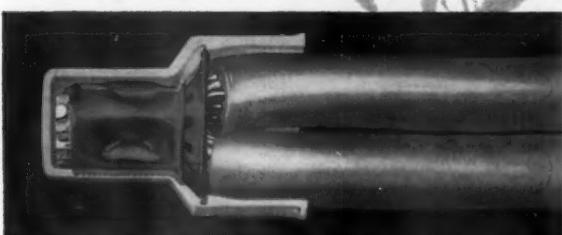
FOR EVERY TYPE OF INSTALLATION
FOR EVERY TYPE OF EQUIPMENT
BELDEN HAS THE CABLE BUILT TO
MANUFACTURERS' SPECIFICATIONS

Belden
Inter-com
CABLE

IT'S A SNAP...



to make **PERFECT** insulated splices with the **NEW BUCHANAN** **Snap-On Insulators**



Cut-away view of new insulator shows metallic retainer ring which securely positions and holds insulator on installed Splice Caps . . . No wrapping. No threading. No vibration worries. Just snap it on!

Easily installed on both rigid and flexible wire splices. Snaps on with equal ease in any climate . . . No wasted time. No wasted labor. Just snap it on!

Approved for applications up to 105°C.

Now . . . your choice of splice insulators—familiar Vinyl Insulator with turn-up security ring or new snap-on Nylon Insulator—both available from Buchanan . . . both UL and CSA approved for use on Buchanan Splice Caps up to 600 volts on building wire and 1000 volts in fixtures.

Use new Nylon Insulator #2007 on Splice Caps #'s 2004, 2004S, 2006, 2006S; #2014 on #'s 2011, 2011S. New Splice Caps #'s 2006 and 2006S take from 2 #18's thru 4 #12's.

Now you can perfectly insulate a splice with greater ease, speed, and simplicity thanks to the brand new companion to the familiar Buchanan Vinyl Insulator . . . New one-piece snap-on-and-lock Nylon Insulator with internal metallic retainer ring assures fast factory-perfect splice insulation . . . even in extremely cold weather . . . even on flexible wire.

With Buchanan's C-24 pres-SURE-tool with exclusive 4-way crimp, you can splice from 2 #18's thru 2 #6's with only 2 sizes of Splice Caps . . . now with a choice of insulators.

Get the facts now—
write today for new Bulletin T-4



BUCHANAN

ELECTRICAL PRODUCTS CORPORATION

HILLSIDE, NEW JERSEY

NEW BRYANT "ROTO-GLO" AC SWITCHES WITH LUMINOUS KNOBS

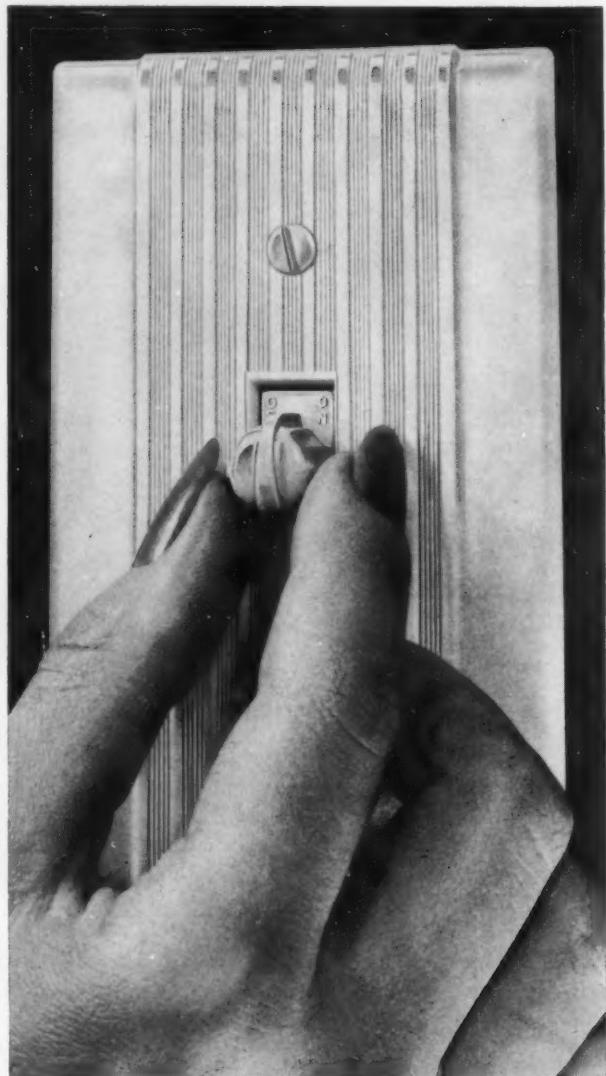
Here are two new-comers to the fast growing line of AC Switches—one of the 1581 series to round out the line of Interchangeable Unit Devices—and the 1591 series—a small compact switch of the strap type.

These switches are quiet in operation and equipped with rotary operated luminous knobs that glow in the dark—to readily spot switch location.

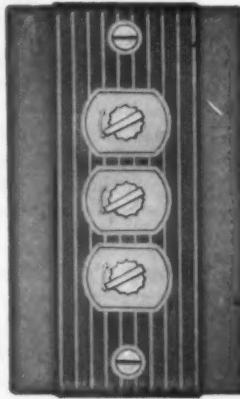
FULL RATED CAPACITY. Roto-Glo switches are rated at 15 Amperes and can be used to their full rated capacity on fluorescent (inductive) and tungsten filament lamp loads and up to 80% of switch rating for motor control.

EASY INSTALLATION. Screwless terminals for easy back wiring—simply insert stripped wire in round hole—connection is complete.

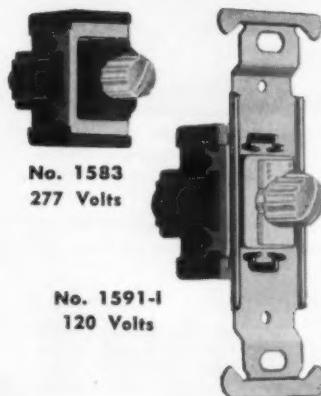
Large silver alloy contacts ensure long life. Mechanisms are totally enclosed in strong plastic housings.



No. 1591-I
Mounted on No. 92071



3 No. 1581-I
Mounted on No. 92031



No. 1583
277 Volts

No. 1591-I
120 Volts

Both series
available in Single
Pole and 3-Way —
Brown or Ivory.

J-99935



THE BRYANT ELECTRIC COMPANY

Bridgeport 2, Connecticut

• CHICAGO

• LOS ANGELES

ROEBLING PAPER POWER CABLE WITH TELLURIUM LEAD ALLOY SHEATH



YOU WANT

- EXTRA FATIGUE RESISTANCE,

PLUS

- LOWEST LONG-TIME CREEP RATE.,
- HIGH BURSTING STRENGTH,
- TOP STABILITY UNDER HEAT,
- ABOLITION OF FREQUENT STOP JOINTS OR REINFORCED LEAD SHEATH,
- ABOLITION OF NEED FOR GENEROUS EXPANSION BENDS OR LARGE MANHOLES ...
- THE DEPENDABILITY ASSURED BY OUR EXCLUSIVE MANUFACTURING, TESTING AND FIELD EXPERIENCE ...

IN SHORT,

YOU WANT

ROEBLING

Subsidiary of The Colorado Fuel and Iron Corporation

JOHN A. ROEBLING'S SONS CORPORATION, TRENTON 2, N. J. BRANCHES: ATLANTA, 934 AVON AVE. • BOSTON, 51 SLEEPER ST. • CHICAGO, 5525 W. ROOSEVELT RD. • CINCINNATI, 3253 FREDONIA AVE. • CLEVELAND, 13225 LAKEWOOD HEIGHTS BLVD. • DENVER, 4801 JACKSON ST. • DETROIT, 916 FISHER BLDG. • HOUSTON, 6216 NAVIGATION BLVD. • LOS ANGELES, 5340 E. HARBOR ST. • NEW YORK, 19 Rector St. • ODESSA, TEXAS, 1920 E. 2ND ST. • PHILADELPHIA, 230 VINE ST. • SAN FRANCISCO, 1740 17TH ST. • SEATTLE, 900 1ST AVE. B. • TULSA, 321 N. CHEYENNE ST. • EXPORT SALES OFFICE, TRENTON 2, N. J.



FIRST IN THE FIELD

JUMBODUCT

INDUSTRIAL UNDERFLOOR RACEWAY

APPROVED BY UNDERWRITERS' LABORATORIES, INC.

The Heavy-duty System for Modern Plant Wiring

National Electric JUMBODUCT offers industry three times the capacity previously available, freedom from the hazards of overhead wiring, *plus* outstanding economy. It's designed to provide readily accessible electrical distribution for industrial locations at a minimum investment.

You'll find a JUMBODUCT specification means:

Plenty of Capacity

4" x 4" cross section provides adequate room for electric wiring to banks of heavy production equipment.

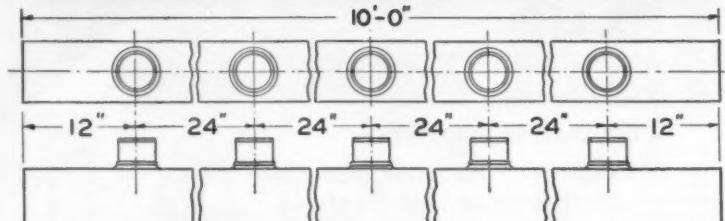
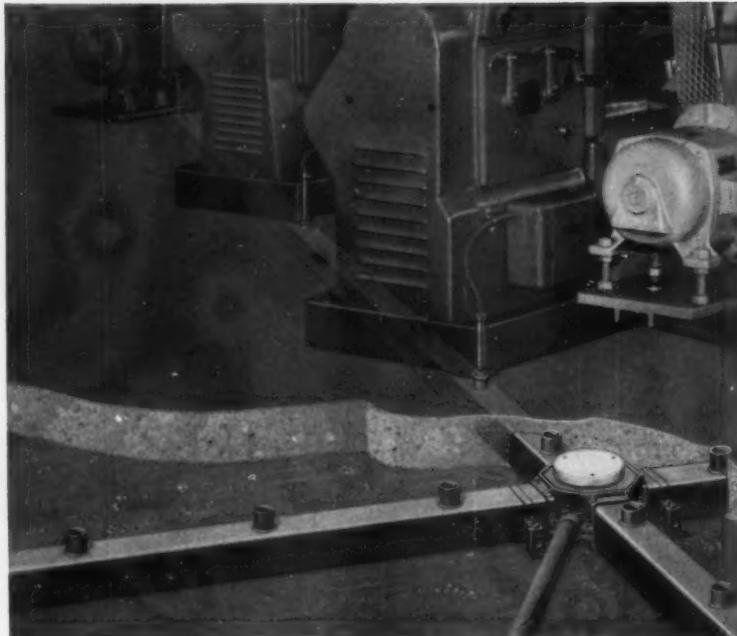
Efficient Power Distribution

2" pipe threaded outlets every 24" permit exact location of equipment for most efficient production layout.

Low Cost

Furnished in easy-to-handle 10' lengths (complete line with junction boxes and a full complement of fittings), JUMBODUCT can be quickly installed in the same simple manner as standard Nepcoduct.

Close proximity of inserts to finished floor makes access quick and economical. Investment in conductors is limited to today's need with ample area for tomorrow's expansion.



INDUSTRIAL NEPCODUCT—CAT. NO. 11055

Safety

JUMBODUCT, protected against corrosion by Sherardizing plus a baked-on coating of acid-resisting enamel, is a completely grounded all-steel electrical system for protection of personnel and equipment.

Get the details on National Electric's newest all-steel, completely grounded industrial underfloor raceway. Write today for a free Engineering Data Book on NE JUMBODUCT.

EVERYTHING IN WIRING POINTS TO →

National Electric Products

PITTSBURGH, PA.

3 Plants • 8 Warehouses • 34 Sales Offices

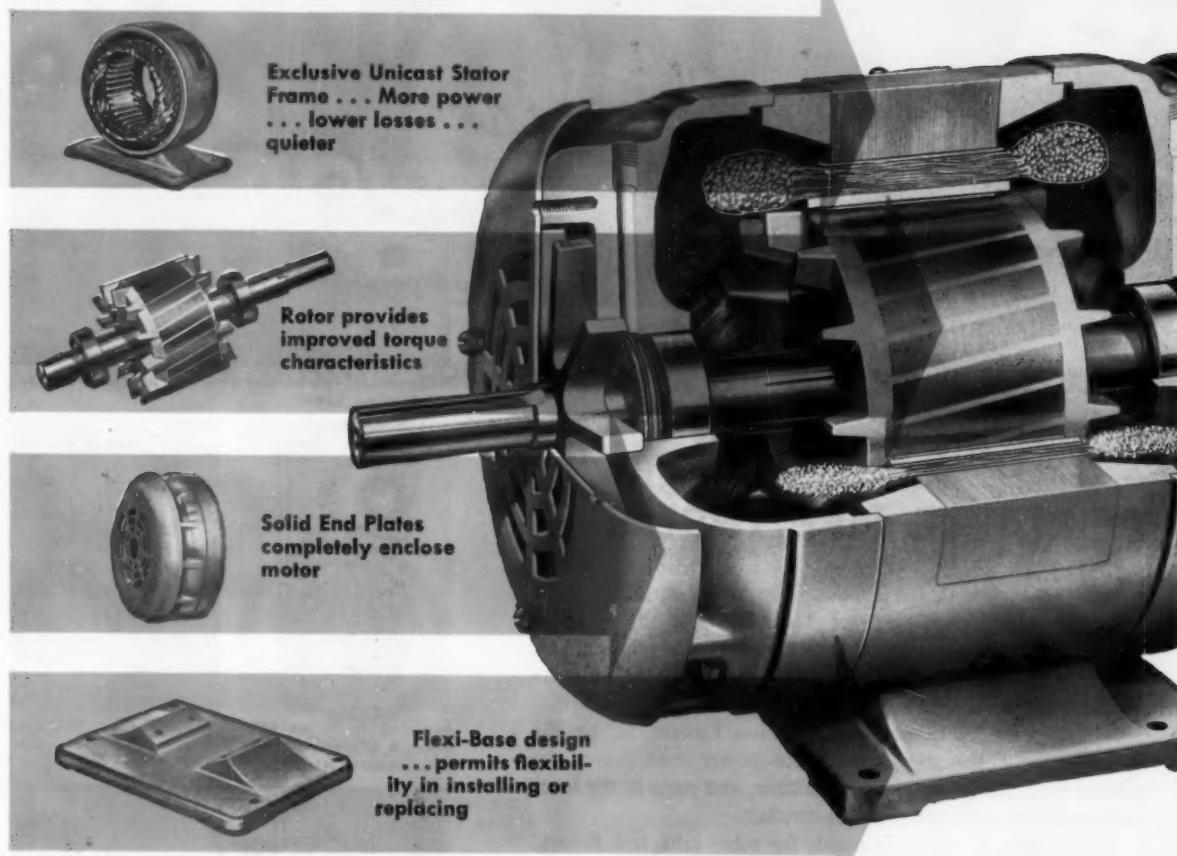


BALTRIC

the motor that doesn't waste an ounce or an inch

The Streamcooled Baltric line of totally enclosed motors is new and better... because it is more compact, more efficient, lighter. Using modern materials and knowledge... improvements that boost efficiency and trim poundage... new insulation... permitting us to build compact power packages that do more work for their size and weight than outdated models of similar ratings.

These powerful, rugged new Streamcooled Baltric Motors will do a better job for you. Their compact size and lightness make them easier to handle and install. Their advanced design and high efficiency will deliver years of satisfactory service.



Don't waste weight and space... use the motors that pack a heavyweight punch in bantam size... *Baltric*.

BBB-4

Original Streamcooled Motors Also Available—Built to Former NEMA Standards

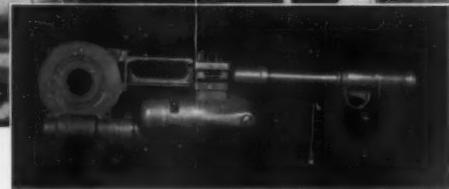
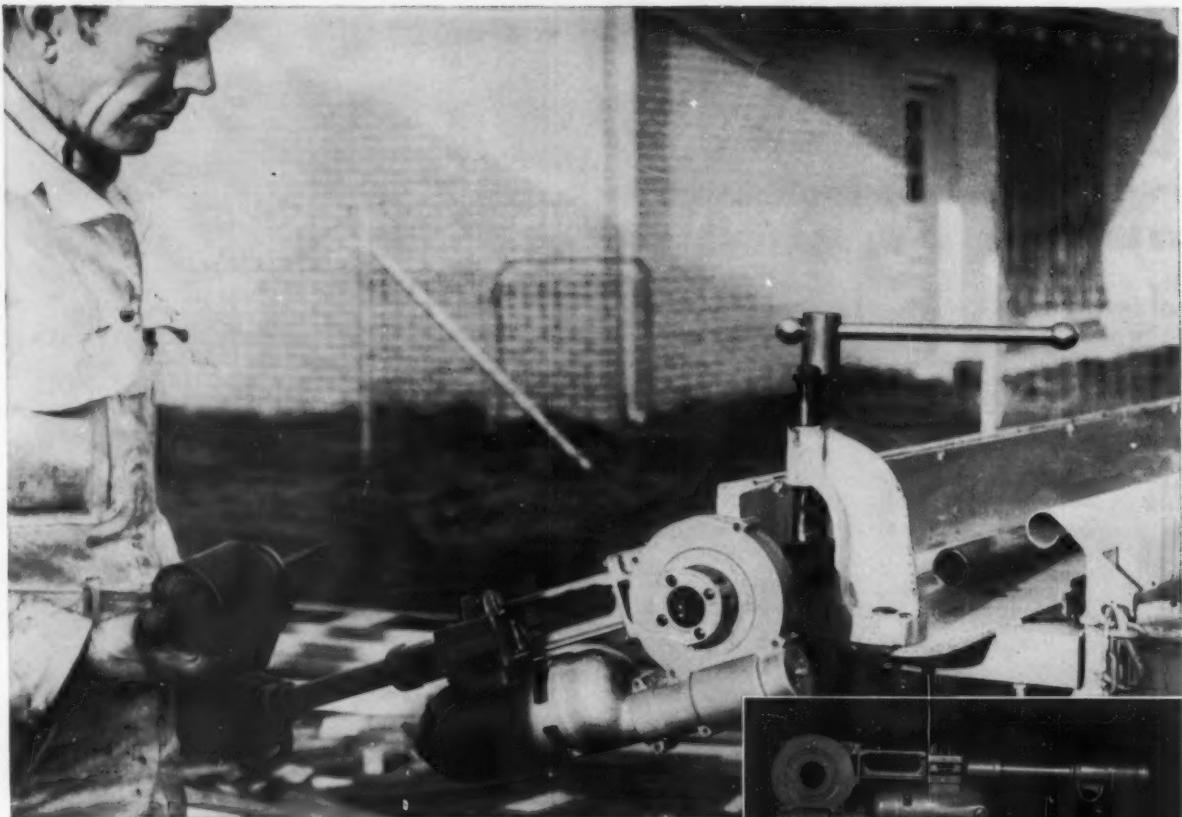
ALL BALTRIC MOTORS TOTALLY ENCLOSED AND STREAMCOOLED

B ALDOR E L E C T R I C C O M P A N Y

Baltric Motors Are Available in Polyphase • Squirrel Cage • Induction and Single Phase • Capacitor Start • Induction Run Types

4353 DUNCAN AVENUE • ST. LOUIS 10, MISSOURI

ELECTRICAL CONSTRUCTION AND MAINTENANCE . . . APRIL, 1955



The Lawco, Jr.—portable, versatile, compact. Does a variety of jobs faster, better.

Threads Conduit in seconds

...the Lawco, Jr.

PORABLE PIPE THREADER

Here's the answer to those slow, tiring, hand-threading jobs. The Lawco, Jr. Portable Pipe Threader does the work in seconds. This modern portable power tool threads the smallest to the largest conduit. Simple adapters and speed reducers handle pipe from $\frac{1}{4}$ -inch to 10".

Its operation is simple. Just position Lawco, Jr. on the conduit, press the trigger, and the power unit drives the cutting dies. You're finished in no time, and right at the location where you are installing the conduit.

And Lawco, Jr. comes in handy for other jobs, too. Several are illustrated at the right. In addition to these applications, you can use your Lawco, Jr. for driving nuts and bolts, and hoisting weights up to 500 pounds.

This light weight (20 lbs.) tool is precision built for years of service. Write for details.



Augering operation with Lawco, Jr. Efficient in vertical or horizontal operations.



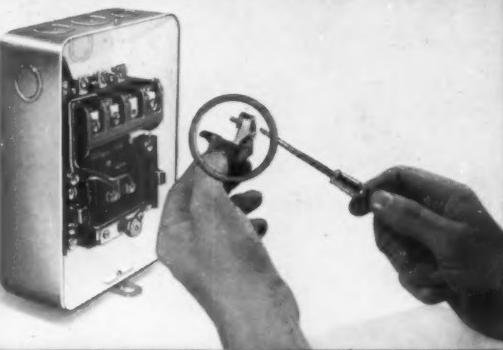
Post hole application using square shank. Lawco, Jr. does it faster.



There's nothing better for pulling wire through conduit than the Lawco, Jr. The unit's portable feature speeds work.

VELOCITY POWER TOOL CO.

201 North Braddock Avenue, Pittsburgh 8, Pa.



ADD

ONE OR TWO PILOT CONTACTS

to Sizes 0 to 3 Allen-Bradley Solenoid Starters

It's so easy to add one or two extra pilot contacts to Allen-Bradley solenoid starters for operating pilot lights or an additional relay or two. These auxiliary contacts are available with either single pole normally open or normally closed contacts, or with normally open—normally closed contacts.

AUXILIARY CONTACTS FOR BULLETIN 709 SIZES 0 & 1 SOLENOID STARTERS



**SIZES 0 & 1
SOLENOID STARTERS**

This is a typical Allen-Bradley Size 0 or Size 1 solenoid starter without external auxiliary contacts.



**AUXILIARY CONTACTS
SIZES 0 & 1**

These are two Bulletin 895 auxiliary pilot contacts which are attached to the arc hoods of Bulletin 709 Sizes 0 and 1 solenoid starters. Be sure to specify the size of starter when ordering these Bulletin 895 auxiliary contacts.



ONE AUXILIARY CONTACT

Here is the same Bulletin 709 solenoid starter with one auxiliary contact fastened to the arc hood.



TWO AUXILIARY CONTACTS

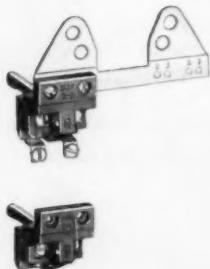
This is the same Bulletin 709 starter to which have been added two Bulletin 895 auxiliary contacts.

AUXILIARY CONTACTS FOR BULLETIN 709 SIZES 2 & 3 SOLENOID STARTERS



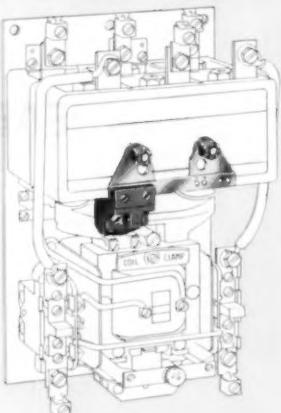
**SIZES 2 & 3
SOLENOID STARTERS**

This is a typical standard Allen-Bradley Size 2 or Size 3 solenoid starter with no auxiliary contacts. Arc hood bolts are used to hold auxiliary contact mounting plate.



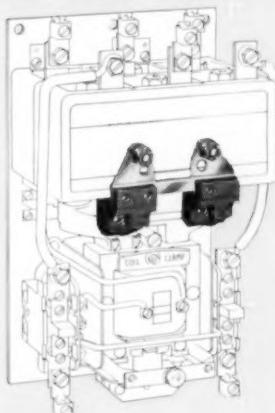
**AUXILIARY CONTACTS
SIZES 2 & 3**

The mounting plate, shown above, is required to support the auxiliary pilot contacts on these larger starters. The same mounting plate fits the Size 2 or Size 3 arc hood bolts. It holds one or two auxiliary contacts, as shown at the right.



ONE AUXILIARY CONTACT

Here is the Size 2 or Size 3 Bulletin 709 solenoid starter to which has been added one Bulletin 895 auxiliary contact. No disturbance of existing wiring in the starter.



TWO AUXILIARY CONTACTS

This is the Size 2 or Size 3 Bulletin 709 solenoid starter equipped with two Bulletin 895 auxiliary contacts on one mounting plate. These contacts are easy to install.

Allen-Bradley Co.
1316 S. Second St., Milwaukee 4, Wis.

In Canada:
Allen-Bradley Canada Ltd., Galt, Ont.



ALLEN-BRADLEY
QUALITY
MOTOR CONTROL

NEW!

OILTIGHT LIMIT SWITCH WITH ADJUSTABLE OPERATING LEVER



Roller Lever
Maintained
Contact



Flush Plate for
Mounting Limit
Switch in Cavity



Roller Lever
Spring Return



Fork Lever
Maintained
Contact



Flush Mounted
Fork Lever



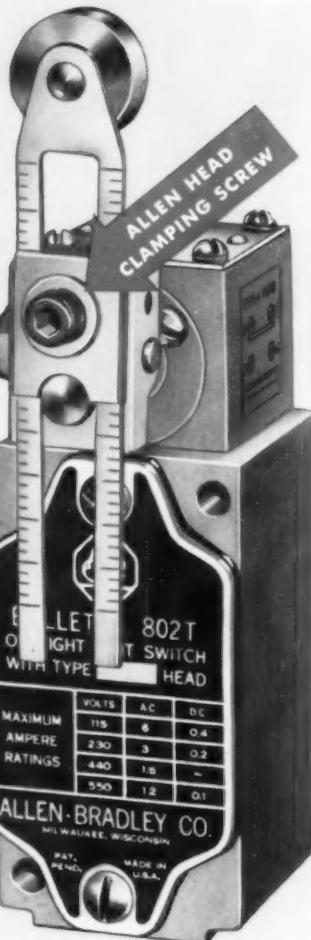
Rod Type
Spring Return



Top Push Rod
Spring Return



Push Roller
Spring Return



Another handy unit has been added to the broad line of Allen-Bradley oiltight limit switches... the NEW Type 802TG limit switch. The operating lever is adjustable from $\frac{3}{4}$ inch to 3 inches in radius.

The lever can be set at any angle on the shaft, and the operating head can be placed in any one of four positions—0—90—180—270 degrees on the body of the switch.

Like all Bulletin 802T limit switches shown here, the new unit has a snap action switch with double break, silver contacts. There is one normally open and one normally closed contact... electrically separated and protected by an oil-tight seal. Terminals are easily accessible.



Send for this 8-Page Bulletin

Bulletin 802T is a handy selection guide for picking the limit switch best adapted to your needs. Write for your copy, today.

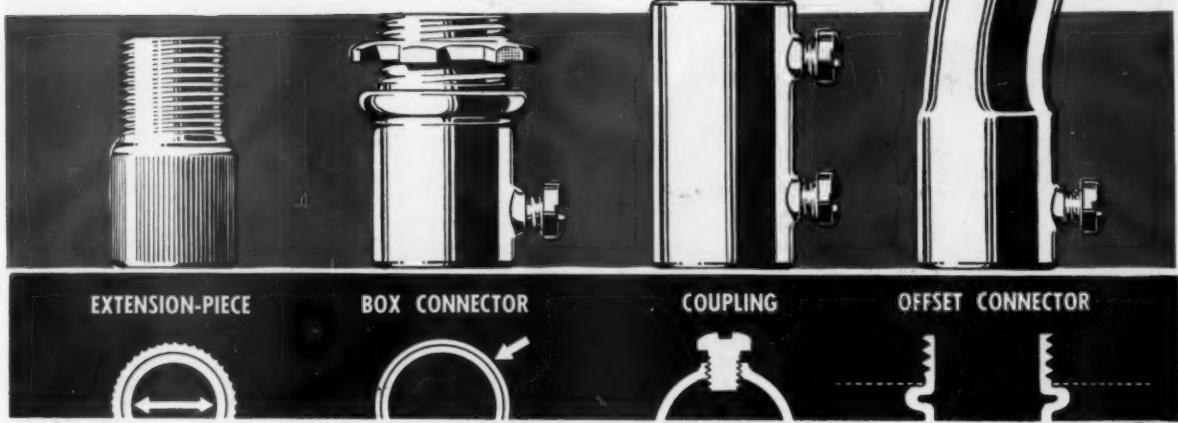
ALLEN-BRADLEY
QUALITY
LIMIT SWITCHES

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis.

In Canada—Allen-Bradley Canada Ltd., Galt, Ont.

Tube-weld

...a new concept in
electric fitting design!



Look closely at every detail of this new line... "Tube-Weld". Its advantages are basic!

All fittings are precision-made of one piece heavy gauge welded steel tubing which has been accurately drawn and sized for controlled uniformity. These fittings cannot open or spread and far surpass UL requirements.

They are made by Electric Tube Products, a division of Berger Machine Products, with over 36 years manufacturing experience.

Tube-Weld fittings represent an entirely new concept in quality, design and price. They are available in $\frac{1}{2}$ ", $\frac{3}{4}$ " and 1" sizes and have the following features:

- Oversized hardened steel set screws are used throughout and are staked for permanency!
- Extra long length of offsets provide exceptionally easy pulling of wire.
- Longer length of fitting provides maximum support for conduit.
- Connector shoulders are uniformly flat assuring perfect centering in the box.
- All threads are rolled instead of cut and have 54% greater stripping strength and 66% greater snapping strength (independent testing laboratory report) over cut threads.
- Lustrous zinc finish and carefully beveled edges add a distinctive appearance - allow largest inside working diameters.
- Carefully and smartly packaged for ease in shelving and identification. For descriptive brochure and additional information write or call:

Electric Tube Products

74-16 Grand Ave., Maspeth (N.Y.C.) N.Y.
DEFENDER 5-8000

CONNECT WITH ETP FOR ECONOMY



A Division of

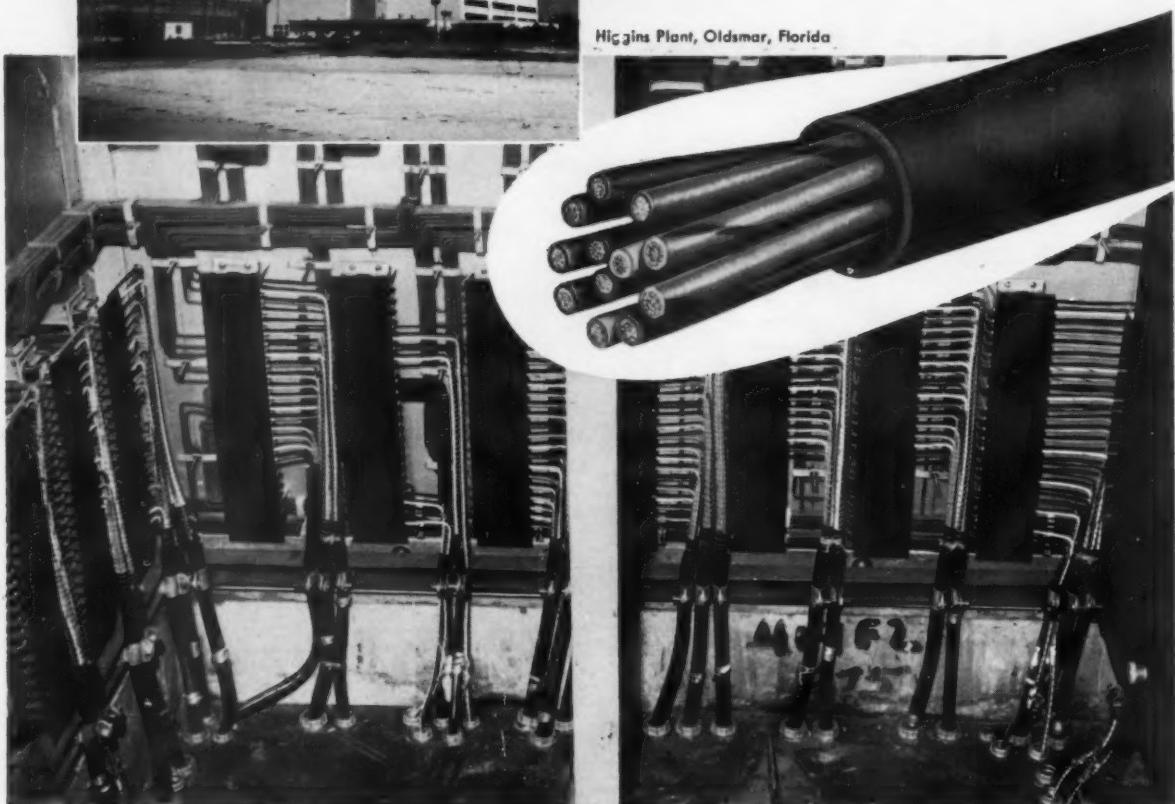
Berger Machine Products, Inc.



FLORIDA POWER CORPORATION

EXPANDS CAPACITY

Higgins Plant, Oldsmar, Florida



USES **ROCKBESTOS PNR[®]** SMALL DIAMETER CONTROL CABLE

Since 1946 Florida Power Corporation has been expanding its generating capacity so that at the end of 1955 it will have a generating capacity of 491,000 kw.

To insure safe dependable operation of its control circuit Florida Power Corporation installed 207,600 ft. of No. 9AWG Rockbestos PNR Small Diameter Control Cable.

You, too, can benefit with Rockbestos PNR. This outstanding control cable lets you pull 12 conductors in conduit where before you had only seven. You save conduit and fittings . . . cut installation costs. Get the full story today. Write or call your nearest Rockbestos Field Engineer.

*Average determined by comparison with conventional control cable.

PROPERTIES OF PNR

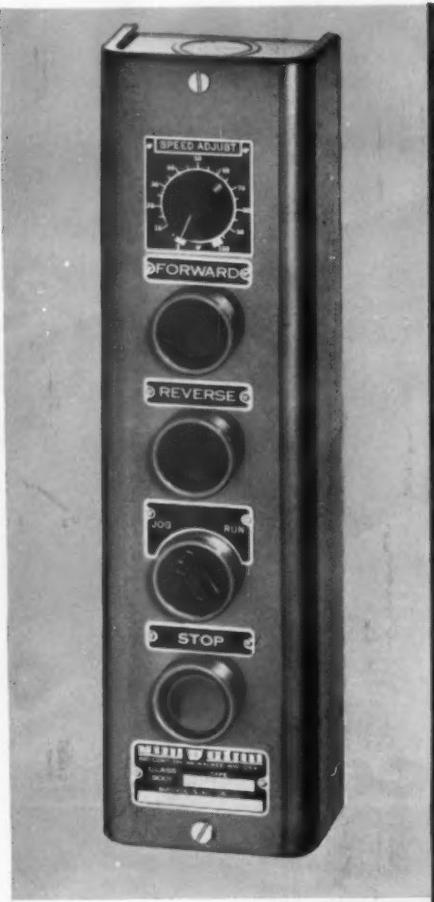
46% smaller in area* . . . 28% smaller in diameter* than conventional control cable. Use smaller conduit and fittings or put more conductors in existing conduit. Lighter, easier to handle, store, ship, pull through conduit. Dielectric breakdown . . . over 40 times operating voltage. Rated 600 volts . . . conductor operating temperature 167°F. Flexible from 167° to -67°F. No cracking!

ROCKBESTOS PRODUCTS
NEW HAVEN 4, CONN.

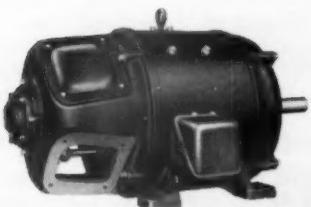


CORPORATION

NEW YORK • CLEVELAND • DETROIT
CHICAGO • PITTSBURGH • ST. LOUIS
LOS ANGELES • NEW ORLEANS
OAKLAND, CALIFORNIA • SEATTLE



For full information and assistance on any motor drive application, AC or DC, call your nearest Century Sales Office . . . or write us direct.



Performance-Rated
1/8 to 400 H. P.



CENTURY ELECTRIC COMPANY

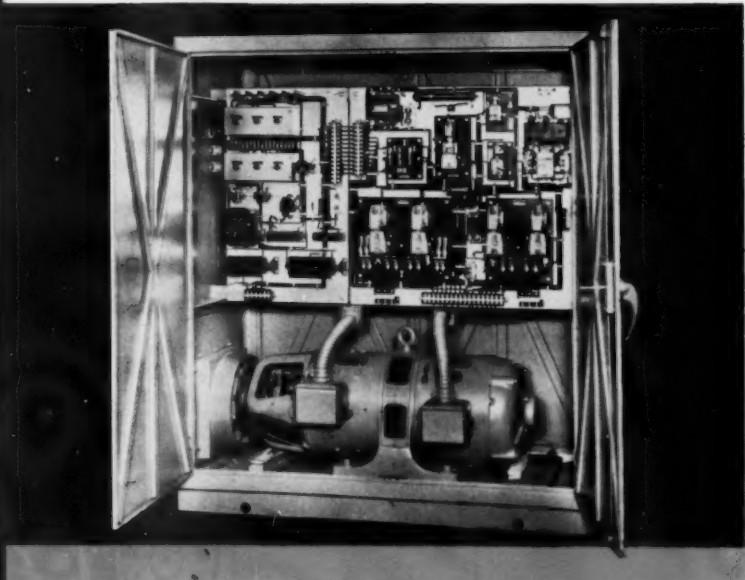
1806 Pine St., St. Louis 3, Mo. • Offices and Stock Points in Principal Cities

ELECTRICAL CONSTRUCTION AND MAINTENANCE . . . APRIL, 1955

The "Unseen Hand"
at the Controls . . .
AUTOMATICALLY SENSITIVE
Performance-Rated®

Century
**SELECTIVE
SPEED DRIVE**

More accurately than the most experienced operator, Performance-Rated Century Selective Speed Drives automatically adjust motor speed to meet operating requirements. Speed changes are integrated with varying pressure, temperature, viscosity or size of the material being worked. You can also use Century Selective Speed Drives for starts, stops and jogs—forward or reverse—as required.





A clean, neat, easy-to-handle

Service Entrance Cable

No longer do sticky, hard-to-handle, unsightly service cables need to be your problem.

The new Rome Service Entrance Cable is easy to handle, neat, clean . . . and not subject to "bleeding" so prevalent with many service cables.

It Costs Less to Buy the Best

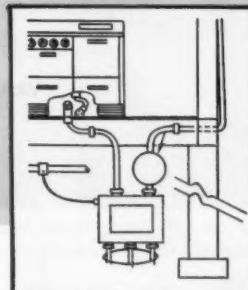


- NEW 45-minute sound color film "CABLE-PATHWAY OF POWER" now available for showings to technical personnel. For bookings, write to Rome Cable Corporation, Rome, N. Y.



Rome SE has four advantages to offer:

1. The outer glass-cotton braid is finished with compounds which give the cable a neat appearance . . . without sacrificing flame and moisture resistance. This finish has a neutral gray color that can be painted, if desired, to match the color of the building on which the cable is installed. It defies severe storage and service conditions without deteriorating and becoming sticky. The impregnation of the outer braid cannot bleed through this finish to make the cable unsightly.
2. The glass-cotton braid on each conductor—one red and one black—is clean, permanent, and provides easy conductor identification.
3. The insulation on each conductor is Underwriters' Laboratories approved as heat-resistant type RH for 75°C . . . moisture-resistant type RW for 60°C.
4. The combination of a clean interior and a clean exterior construction provides a neat flexible cable that is easier to handle and makes a better looking installation.



Rome Service Entrance Cable can be used from service drop to meter and from meter to electric range or water heater. It can also be used as a single cable directly from pole to meter.

Let us send you a sample of the new Rome Service Entrance Cable for your own examination. Write today.



Mount just one box and the complete service entrance system is neatly installed.

New G-E 12 circuit load center has 100 ampere main breaker wired right in. It accommodates 12 single-pole or 6 double-pole circuit breakers or any combination of both. U/L listed.

Installation is compact and simple with the new G-E 12 circuit load centers, Catalog Number TRM 1210F (flush mounting) and TRM1210S (surface mounting). This is your answer for good looks and better workmanship.

Fronts with doors are standard equipment. Locks are optional.

New G-E combination load center with 100 amp main breaker eliminates separate disconnect, gives you 7 quality extras.

You get all 7 quality extras at no extra cost

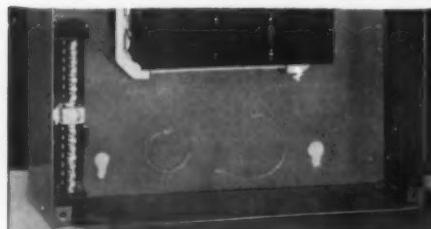
Automatic 2-way alignment. Spring mounted interior assures alignment of breakers with cover and cover with plaster in flush mounting. No screws to adjust.

Silver plated copper for current-carrying parts insures cool, efficient operation for long life.

Bonderite* treated. Bonderizing bonds paint to steel . . . the surface is rust-resistant and satin-smooth. A G-E exclusive!

Full-length door with provision for optional lock kit is standard equipment. Another G-E exclusive!

Excellent appearance made possible by quality construction and finish.



Straight-in wiring on all connections. Insert, tighten screw; no looping. Grips like a bear trap.

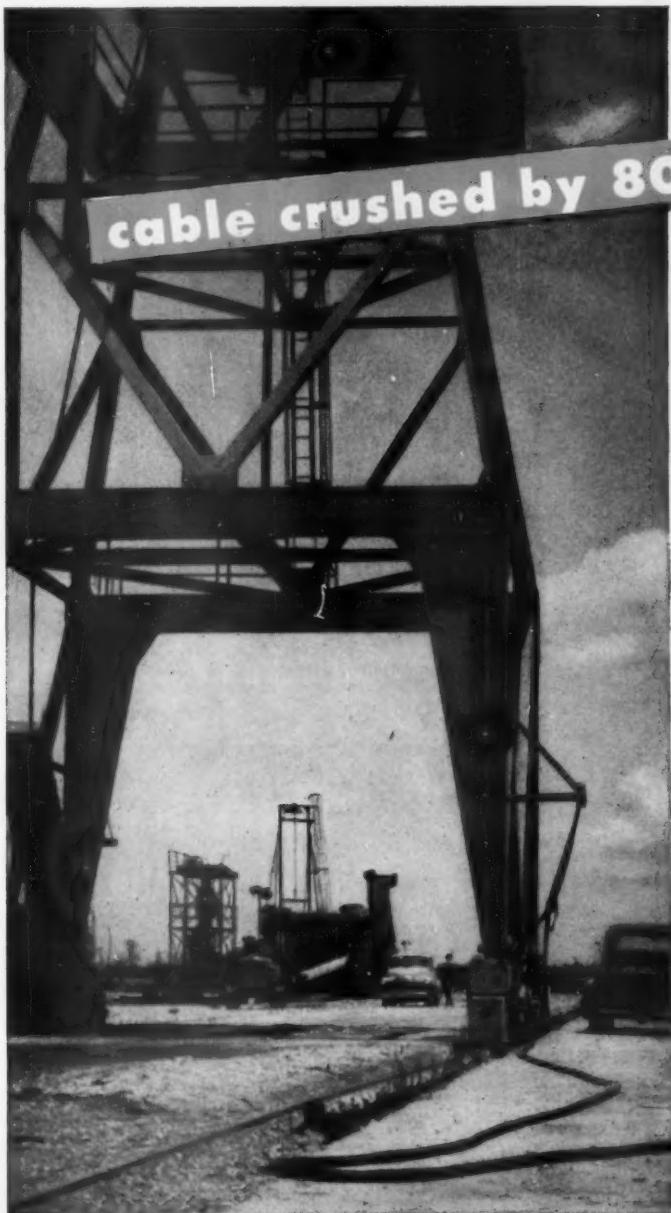


Snap-in installation. Plenty of working room! Interior snaps in spring mounting . . . no screws.

*Parker Rust Proof Co.

For more information see your G-E Trumbull distributor or write General Electric Company, Trumbull Components Department, 48-63 Woodford Avenue, Plainville, Connecticut

GENERAL  **ELECTRIC**



but electrical service was uninterrupted

Shortly after the first length of Hazacord portable cable was installed on one of the gantry cranes operated by a large petroleum plant, the 80-ton crane ran over its cable, crushing and mangling it. Without interruption the cable continued to deliver the electrical power that kept the crane on the job. Removed for inspection, this length of Hazacord showed the insulation on each conductor was in place and complete although noticeably crushed and deformed.

Since that time, Hazacords have given more than two years of trouble-free service on this gantry crane and the others at this plant, although standard cables had previously lasted only a few months. This increased cable life, together with the graphic demonstration of Hazacord's toughness provided by the 80-ton runover have made Hazacord standard on many of the severest operations at this plant.

And this is only one of the accidents and unusual services that have proved Hazacord cables can withstand the roughest usage without failure and costly down-time of the equipment. If you have a problem involving portable cable, call or write your Hazard representative. Or contact Hazard Insulated Wire Works, Division of The Okonite Company, Passaic, N. J.



2710

HAZACORD
Mold-Cured
portable cables

PRODUCT
OF
OKONITE
RESEARCH

Model 4300-PB

Specify the *Levolier*® No. 71 WHERE SPACE IS LIMITED



It's only $1\frac{1}{32}$ " thick

Here's just the switch you need for your streamlined lighting canopies and fixtures, and FHP motor housings where switch space is limited. Only $1\frac{1}{32}$ " thick, Levrier No. 71 fits in the smallest spaces. It carries Underwriters' "T" rating on the famous Levrier mechanism that assures dependable, trouble-free switch performance. Furnished with durable molded phenolic case, patented lever control, pull chain and 6" wire leads.

HEAVY DUTY PORTABLE LIGHTING



650-SR

Extra heavy cages
with NO-ROL feature
Molded Rubber Handles

McGill Rubber Handle Lamp Guards are heavy-duty, highly versatile and will last many times longer than ordinary portables in all industrial uses. The cage is built of extra-heavy steel wires, electrically spot welded and heavily zinc-plated. It has a bright chrome finish — open or closed end. Model 7100-SR fastens cage to handle with a clamping arrangement that makes lamp changing fast and easy without tools. Available with or without Levrier switch. Completely Underwriters' approved.



7100-SR

only
McGILL
makes
Levolier
Switches

RUGGED THROUGHOUT McGILL® industrial lampholders are built to outlast all others

From the mechanism through to the outer shell, McGill Lampholders are built heavier to last longer and cut replacement costs. They have a screw shell .006" heavier than standard, a proven-dependable Levrier switch mechanism, and an extra heavy, impact-resisting molded phenolic shell. Models are available with single and two-circuit mechanism, pull-chain, plain-lever and push-button control, with or without shade threads.

Levolier® No. 21 offers LOW COST DEPENDABILITY



in 3-amp switches

Especially durable — yet inexpensive, the Levrier No. 21 switch is the quality 3 Amp "T" 125 volt switch on the market today. It features pull-chain control and 6" wire leads permanently fastened to terminals by pressure connections. The molded phenolic case measures $1'' \times 1\frac{1}{4}''$. Will accommodate mounting thickness up to $5/16''$. A desirable switch to put dependability into lower amperage current control.



YOU CAN DEPEND ON
McGILL
QUALITY

Available through leading Electrical Wholesalers

For complete information on products of the McGill Electrical Division, write today for Catalog No. 49-A.



McGILL MANUFACTURING COMPANY, INC.
450 N. Campbell St., Valparaiso, Indiana

Roller-Smith

PROUDLY
ANNOUNCES
the
NEW...



UNI-BUS BUSWAY

A New Concept in busway systems that obsoletes all other methods of carrying current.

- Low Voltage Drop in **PLUG-IN AND FEEDER TYPES**.
- High Short Circuit Strength in **PLUG-IN AND FEEDER TYPES**.
- **ONE FLEXIBLE FITTING** makes elbows, offsets —simplifies engineering and eliminates costly delays.
- **COMPLETE SAFETY** because live bus bars at plug outlets and live connections in plugs are eliminated.

Roller-Smith
CORPORATION
ELECTRICAL SWITCHGEAR
BETHLEHEM, PENNSYLVANIA

And All at Lower Cost!

ECONOMY

New clip-on hanger and lighter weight busway mean less installation time. Feeder system often costs less than conduit and wire, yet is 100% reusable.



FLEXIBILITY

Flexible connector eliminates all special fittings so that a minimum number of components meet all job requirements. Plug-in and feeder systems interchangeable.



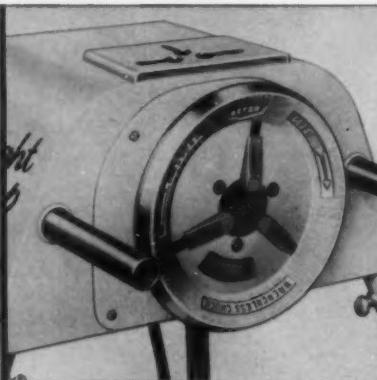
SAFETY

Interlocked safety slide over plug outlet cannot be opened until covered by plug. Interlocked cover and reliable contacts in plug are positive assurance of safety.



CONTRACTOR THREADS PIPE 4 TIMES FASTER

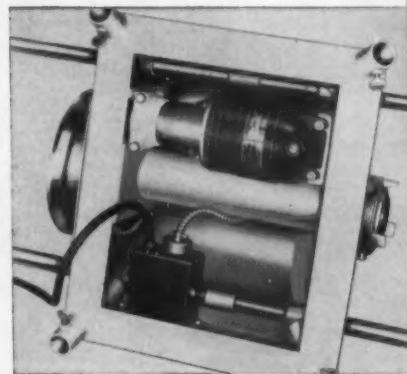
with the new **OSTER** No. 432 Lightweight Champ



1 "The time this 'Lightweight Champ' saves means time to handle more jobs and make extra profits. Take a look at some of the features that make this portable power drive a moneymaker for me.

2 "The new wrenchless chuck, for instance. A spin of the wheel, and it grips securely in both directions. No bar or chuck wrench needed here!"

3 "With my hand tools converted to power tools, I cut off, ream and thread 1" pipe in 59 seconds. That's four times faster than I can do it by hand. Notice the vise-mount plate—it's universal—takes any make of pipe vise—another exclusive Oster feature."



4 "It takes plenty of power to make top-quality threads fast—and this machine has it in a new, more powerful motor. Universal, geared-head type, reversible, variable speed."

5 "Although all-steel construction makes the 'Lightweight Champ' practically indestructible, it's easy to throw on the truck and take to the job. I set it up, ready to work, in two minutes. No more hand threading for me!"

...the most
DURABLE
2" portable
power vise stand
on the market!

Improved design, lighter weight, and more powerful motor make the new Oster No. 432 "Lightweight Champ" an even greater value than the famous No. 422 which preceded it. Standard range is $\frac{1}{8}$ " to 2" pipe; range with geared tools, $2\frac{1}{2}$ " to 12" pipe.

Get all the facts now by calling your nearby Oster Dealer, or write us direct for Booklet No. 432.

THE

OSTER

MANUFACTURING CO.

Main Office and Factory:

2046 East 61st St., Cleveland 3, Ohio

New York Factory Branch Sales and Service,
25-36 Jackson Ave., Long Island City 1, N.Y.

BUILDERS OF COST-REDUCING THREADING EQUIPMENT SINCE 1893

UPTEGRAFF DISTRIBUTION TRANSFORMERS

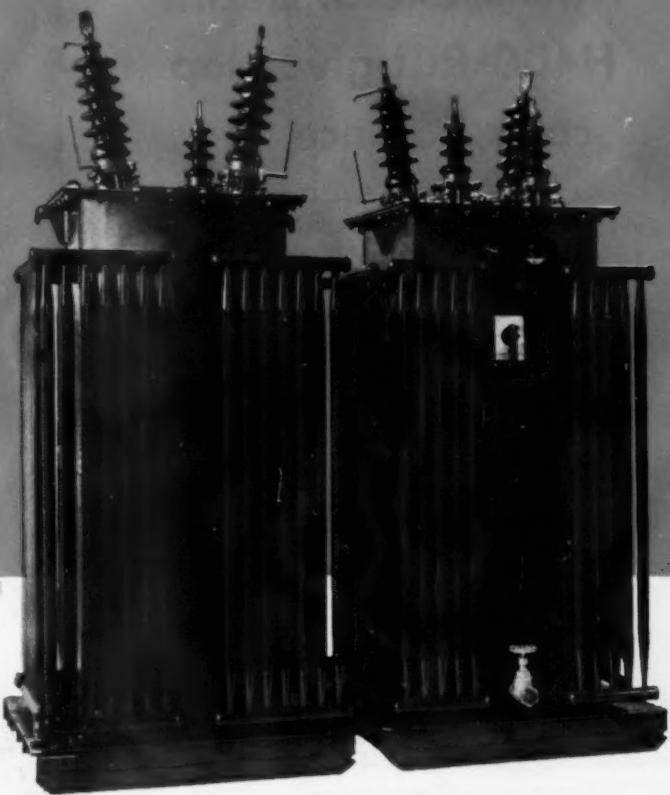
SEALED TANK
CONSTRUCTION

*means longer-life
low maintenance*

Tight sealing that prevents "breathing" and the entrance of moisture, prolongs the service life of Uptegraff Transformers. Oxygen and moisture are found to be the principal causes of oil deterioration. All flanges and openings are so effectively sealed, that even the keen perception of the super-sensitive electronic Leak Detector does not find any sign of leakage.

This is only one of many features that give Uptegraff Transformers exceptionally long life expectancy, and reduce maintenance costs.

Uptegraff makes distribution transformers in all commercial ratings, from 3 KVA to 500 KVA, and in a complete series of dry type air-cooled designs, as well as the liquid-filled units.



Every liquid-filled Uptegraff Distribution Transformer is checked by the electronic Leak Detector before shipment. The photograph above shows front and rear views of a single phase, 60-cycle, 26,400-13,100Y 7560 volts, 500 KVA transformer.

R. E. UPTEGRAFF MANUFACTURING COMPANY
Scottdale, Pennsylvania

... another advance in mercury lighting from G. E.

Now 54% more light from G-E 400-watt mercury lamp

New General Electric H400-RC1 gives top color balance, too

In another mercury lighting first, General Electric has raised the light output of the H400-RC1 mercury lamp from 12,300 to 19,000 lumens! This 54% increase in efficiency results from using a special fluorescent phosphor as a reflector as well as to improve color balance. Its color characteristics are best of any mercury lamp for general lighting. Color rendition approximates a mixture of $\frac{1}{3}$ filament light and $\frac{2}{3}$ mercury light.

The new G-E H400-RC1 mercury lamp has a life rating of 6000 hours at 5 or more hours per start. It operates on the same equipment as all other 400-watt mercury lamps and is interchangeable in most reflectors.

With its controlled beam, good color, easy maintenance, and high light output, it is first choice for most mercury lighting applications.

For more information on how this new mercury lamp can fit your operation, call your G-E Lamp supplier, or write General Electric Company, Lamp Division, Dept. 166-EC-4, Nela Park, Cleveland 12, Ohio.



COMPARE NEW G-E RC1 WITH OTHER 400-WATT MERCURY TYPES

NEW RC1 VS H400-E1

- Light on the work equal or greater in most equipment
- Adds color balance
- Less maintenance



NEW RC1 VS H400-J1

- Delivers 10-20% more light on the work in most equipment
- Has somewhat better color balance
- Lower cost of light



NEW RC1 VS H400-A1

- 35% more light on the work in most equipment
- Has good color balance
- Lower cost of light



Progress Is Our Most Important Product

GENERAL  ELECTRIC

COLUMBIA E.M.T.

PAT. PEND.

NEW

NEW-SATIN SMOOTH
INTERIOR FINISH
CUTS WIRE PULLING TIME



NEW-OUTSIDE FINISH
SMOOTH AND
EASY-TO-HANDLE

Beats 'Em All
FOR FISHING SPEED
BENDING EASE

Columbia E.M.T. is new—inside and out. The new Columbia E.M.T., with the recently perfected interior finish, speeds fishing and wire pulling. See for yourself—try Columbia E.M.T. on your next job.

APPROVED BY UNDERWRITERS' LABORATORIES



COLUMBIA CABLE & ELECTRIC CORP.

Serving the Electrical Wholesaler Since 1912

255 Chestnut St. Brooklyn 8, N. Y.

Sales Representatives in the Following Cities: Atlanta, Ga., Boston, Mass., Charlotte, N. C., Chicago, Ill., Cleveland, Ohio, Cincinnati, Ohio, Dallas, Texas, Detroit, Mich., Glassport, Pa., Houston, Tex., Kansas City, Mo., Los Angeles, Cal., Minneapolis, Minn., New Orleans, La., New York, N. Y., Philadelphia, Pa., Portland, Ore., St. Louis, Mo., San Francisco, Cal., Seattle, Wash., Utica, N. Y., Tulsa, Okla.

FACTS ABOUT EXIDE®

EMERGENCY LIGHTING SYSTEMS

**WHEN LIGHT MEANS LIFE
DEPEND ON EXIDE EMERGENCY LIGHTING!**

... and their hostages is to become a bloody abattoir.

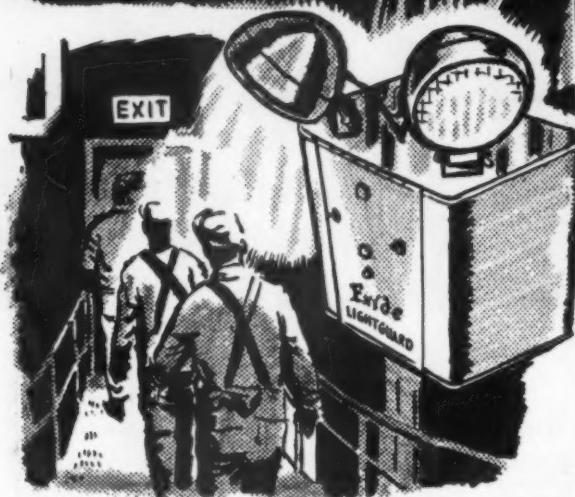
Surgeon Works As Power Fails

An emergency operation was completed successfully at [REDACTED] Hospital yesterday despite a 40-minute electric power failure that knocked out all lights, heat, elevators and dumb-waiters.

The power transfer to a battery-powered emergency system in the institution was made so smoothly that some attendants in the operating room were not aware of the disruption. A break on a main line on [REDACTED] blvd. was responsible for the power failure from 8:50 to 9:30 A. M.

[REDACTED] Auto Bomb Kill

credit
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Well
much
action
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of an



**WHEN LIGHTS GO OUT...
EXIDE-LIGHTGUARDS GO ON!**

WHENEVER STORMS, FLOODS, ACCIDENTS OR FIRES CAUSE UNEXPECTED POWER FAILURES, COMPACT, PORTABLE EMERGENCY LIGHTING UNITS FURNISH LIGHT INSTANTLY AND AUTOMATICALLY! THEY PREVENT PANIC, INJURIES, PROPERTY DAMAGE, LOOTING!



HUNDREDS OF PROFIT-MAKING SPOTS

EXIST IN YOUR COMMUNITY - IF YOU SELL EXIDE LIGHTGUARD PROTECTION! WHEREVER PEOPLE GATHER, WHEREVER SUDDEN DARKNESS CAN BE COSTLY, YOU CAN SELL COMPACT, PLUG-IN EXIDE LIGHTGUARD UNITS. THEY LIGHT UP INSTANTLY, AUTOMATICALLY, TO PREVENT PANIC, INJURIES, PROPERTY DAMAGE AND THEFT.

MAIL THIS COUPON NOW

EXIDE INDUSTRIAL DIVISION

The Electric Storage Battery Company
Philadelphia 2, Pa.

YES . . . I want to cash in on emergency lighting sales.
Rush details on new Exide Lightguard units.

Name _____

Address _____

City _____ Zone _____ State _____

My business is: Electrical Contractor Consulting Engineer
 Architect Distributor
 Electrical Engineer Dealer

Exide Industrial Division. The Electric Storage Battery Company, Philadelphia 2, Pa.

*New pier
for a busy
seaport...*



WIRE BY PHELPS DODGE

*... Unusual construction calls for
aerially-installed cable with submarine-type insulation!*

New York City's new 12-million-dollar Department of Marine and Aviation Pier 57 is one of the most modern in the world—and so is its wiring system.

A unique feature of the system is a cable with submarine-type insulation, installed aerially without physical protection of any kind. This installation offers most of the advantages of a conduit system at a far lower cost. The cable can withstand varying temperatures estimated from minus 10 degrees Fahrenheit to 130 degrees Fahrenheit and humidity up to 100%.

This cable was designed and tested to meet the special requirements of the Dept. of Marine and Aviation, City of New York, including U. S. Coast Guard specifications for submarine-type cable.

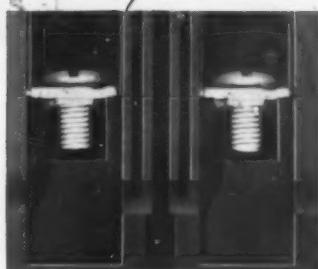
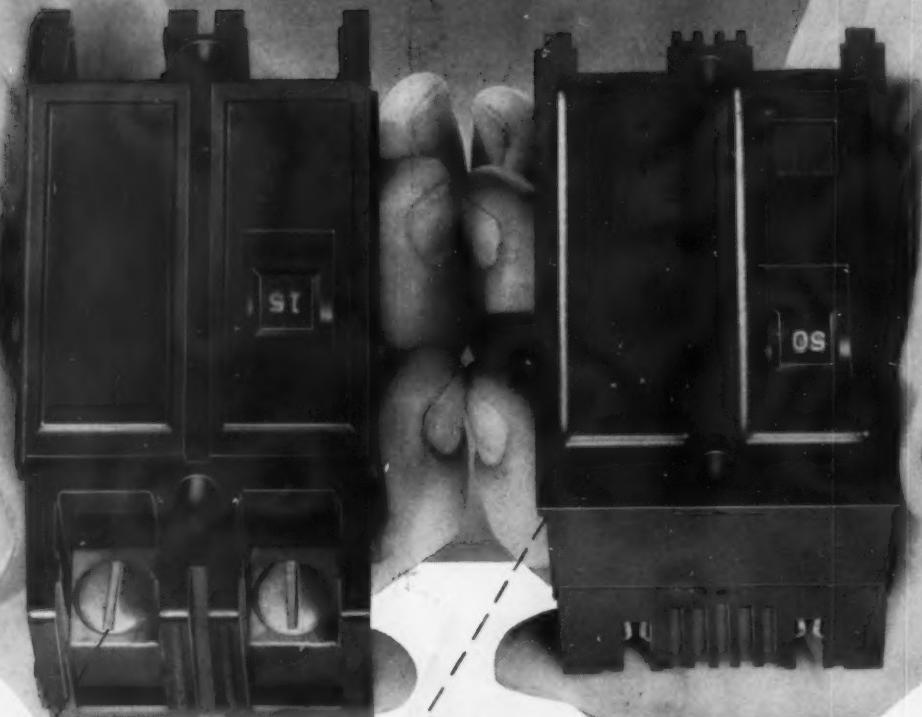
All of the wire and cable for the pier was supplied by Phelps Dodge.

On every wiring job, large or small, where top quality materials, expert workmanship and experienced "know-how" are called for, *it pays to rely on Phelps Dodge and your Phelps Dodge distributor!*

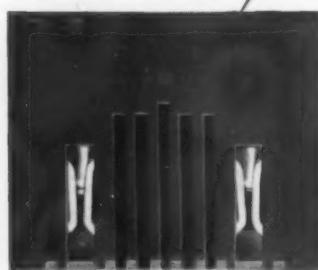


**PHELPS DODGE COPPER PRODUCTS
CORPORATION**

SALES OFFICES: Atlanta, Boston, Buffalo, Charlotte, Chicago, Cincinnati, Cleveland, Dallas, Detroit, Fort Wayne, Greensboro, N. C., Houston, Jacksonville, Kansas City, Mo., Los Angeles, Milwaukee, Minneapolis, New Orleans, New York, Philadelphia, Pittsburgh, Portland, Ore., Richmond, Roanoke, San Francisco, St. Louis, Seattle, Washington, D. C.



"Bolt-on" type breaker completes the Westinghouse Quicklag line—offers a two-pole Quicklag breaker for every application.



"Plug-in" type breaker is firmly gripped by a female line terminal clamp plus pressure contacts on the load end of the breaker.

New!

Two-pole common-trip Quicklag® breakers—"bolt-on" or "plug-in"

Whatever your choice of mountings, the new Westinghouse two-pole, common-trip Quicklag circuit breaker can now give you more flexible and efficient protection for small-wire general lighting and branch circuits. Available in 15-50 ampere ratings—120/240-volt—for a-c circuits in loadcenters, panelboards, individual applications.

Common-trip bar opens both poles simultaneously with an overload on any one pole. Single handle indicates "trip", "on" or "off". All ratings listed by Underwriters' Laboratories, Inc.

Thermal-magnetic tripping elements, De-ion® arc quenchers, a proven quick-make, quick-break mechanism, and non-welding silver alloy contacts—all combined in electrically isolated compartments—assure protection against small overloads, instantaneous magnetic action against short circuits, and longer operating life. Call your Westinghouse representative, or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa.

J-30184

YOU CAN BE SURE...IF IT'S

Westinghouse



Red Throat

B-M 21B, THE NEW INSULATED THROAT

INDENTER
CONNECTOR
FOR E.M.T.

*Four Ways
Finer*



- 1 Protruding rounded red plastic lip of bushing prevents cutting of insulation—eliminates shorts.
- 2 Full thread screws into all conduit fittings. Lip of RED THROAT bushing protects thread from damage.
- 3 Deep dished eight pronged lock nut is easier to drive on—screws flush to shoulder and digs into metal of box for vibration proof positive ground.
- 4 Permanent locked-in bushing insures smooth burr-free raceway for easy fishing. No extra work and costs no more.

Briegel, the Original Indenter Fittings are neater in appearance, easier and faster to use. Installation is simple and less expensive. Two quick squeezes sets them forever. Try B-M Indenter Fittings and get more profits from each job!

ALL BRIEGEL FITTINGS ARE U.L. APPROVED AS CONCRETE-TIGHT

Order from Your Wholesaler

All B-M Indenter
Fittings are U.L. Approved
as concrete-tight and for general
use (File Card E10863). Also comply
With Federal Specifications W-F-406.



BRIEGEL
METHOD
TOOL
CO.
GALVA • ILLINOIS

Warehouse Stocks in Principal Cities for Immediate Delivery!

STUDIES SHOW

Cables run cooler in Transite Ducts!

HOW TRANSITE DUCTS

I. INCREASE CURRENT CARRYING CAPACITY

	TRANSITE INORGANIC DUCTS	ORGANIC DUCTS
1. Total Therm. Res. to Dielectric Loss (thermal ohms)	5.61	6.03
2. Total Therm. Res. to Copper Loss (thermal ohms)	4.21	4.62
3. Temp. rise from Dielectric Loss (C)	1.9	2.1
4. Allowable rise for Copper Loss (C)	59.1	58.9
5. Allowable watts for Copper Loss per ft. cable	4.70	4.25
6. Allowable Current—(Amps per cdr)	398	378
7. Allowable Current—(Relative %)	105.1	100

II. YIELD DOLLAR SAVINGS

B. Greater heat carrying ability of Transite (%)	110.6
9. Watts loss per foot at equal currents: Organic Duct Transite	4.25 3.84
10. Savings in losses with Transite (watts/ft.)	.41
11. Annual dollar savings (@ \$20/KW per M ft.	\$8.20
12. Annual greater charges for Transite per M ft. on basis: 1½ ducts per cable Diff. mat. cost—\$.04/ft. Carry. Chgs.—Int. 6%, Taxes 2½% Depr. 1½%; Total 9½%	\$5.06
13. Net annual savings with Transite \$ per M ft.	\$3.14

CONDITIONS: Cable—3 Cdr. 500 MCM Compact Sector, 175 mils paper, 125 mils lead 15 KV grounded neutral 18th Edition AEIC Spec. Theoretical Cable Dia. —2 5/8". Duct—2 x 2 bank, 3 looped, 4" x 5" spacing, 30" earth cover, 3" Concrete around ducts. Concrete-Soil Resistivity—84 (watt-cm). Load Factor 75%—Loss Factor 6.2 ½%. Earth ambient 20°C.

—and copper losses are reduced... current capacity is increased... insulation life prolonged

TESTS have been made for many years by the Johns-Manville Research Center, to determine how Transite Ducts improve the dissipation of heat by conductors under load. The application of the test results is summarized above.

The figures prove that Transite Ducts will carry heavier current loads than organic ducts when sheath temperatures are the same. The result is a cooler cable under a given load... lower I²R losses... longer insulation life from lower operating temperatures.

Transite Ducts offer many other advantages,

too. Made of asbestos-cement, they are incombustible, resistant to corrosion, unaffected by electrolysis. When arcing occurs, Transite protects adjacent cables from damage. These durable, light-weight ducts provide complete and permanent cable protection, together with savings on installation and maintenance.

For complete details on these tests and the many advantages of Transite Ducts, write for free copy of Brochure EL-29A. Address Johns-Manville, Box 60, New York 16, N. Y. In Canada, 199 Bay Street, Toronto 1, Ontario.



Johns-Manville TRANSITE DUCTS

TRANSITE KORDUCT—for
Installation in concrete

TRANSITE CONDUIT—for exposed work and installation
underground without a concrete encasement

**Engineer your high voltage supply
system at lowest cost with**

S&C Metalclad Switchgear



Geo. M. Baxter,
Plant Engineer at
Harper, points to
tie unit.

THE H. M. Harper Company did! This company, located in Morton Grove, Illinois, manufactures nonferrous fastenings. A few years ago it began a long range plant expansion program by modernizing its electrical system — distributing its power at high voltage.

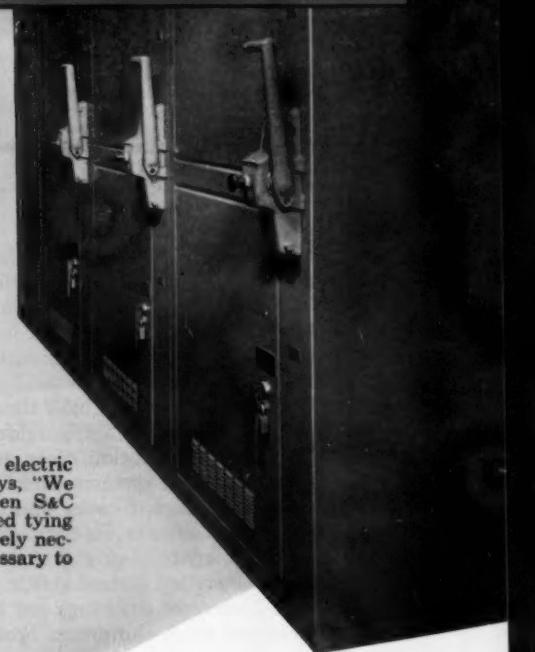
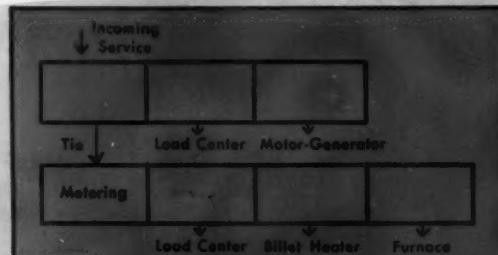
The first step was installation of S&C Metalclad Switchgear—a 3-unit assembly which served a load center and a motor-generator, and provided a spare for future needs. Two years later a second 4-unit assembly was added to serve the new metals plant, and was tied to the incoming service through the spare unit of the original assembly.

S&C Metalclad Switchgear is engineered to perform all the necessary protective and switching functions—yet it costs only about half as much as most alternate equipment. As a result the economies from its use are often tremendous.



Mrs. Don Rieger

of C & H Electric Co., who planned and installed the electric power distribution system at The H. M. Harper Co., says, "We were especially pleased that our original choice had been S&C Metalclad Switchgear when the latest changes necessitated tying the two switchgear assemblies together, because it was merely necessary to change fuses in the tie-in unit . . . it was not necessary to replace expensive breaker equipment."



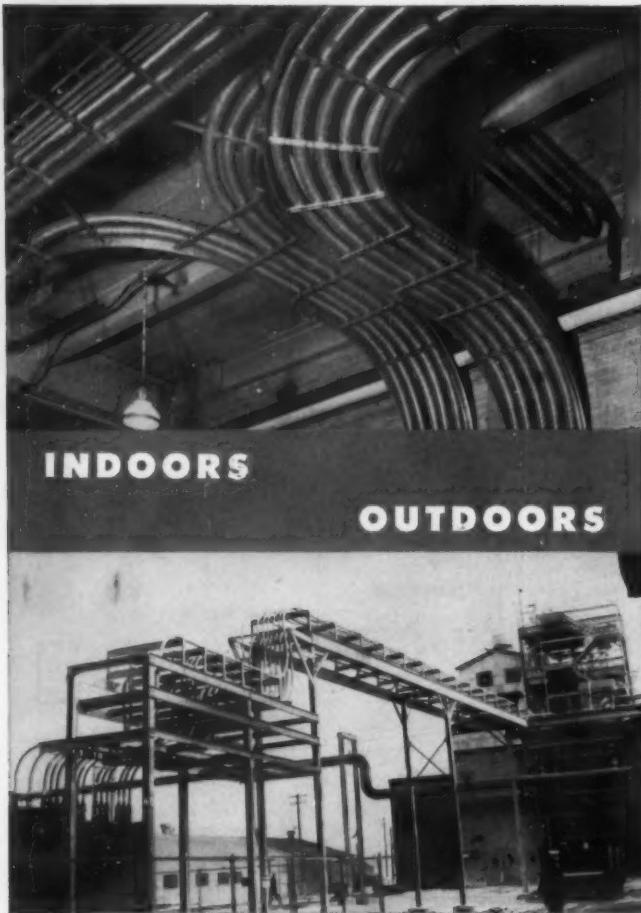
Specialists in High-Voltage Switchgear for Electric Utilities since 1910

ELECTRIC COMPANY

Plant and General Office: 4433 Ravenswood Ave., Chicago 40, Ill.

Consult your telephone directory. Sales offices located in Birmingham, Boston, Buffalo, Chicago, Clayton (St. Louis), Cleveland, Dallas, Dearborn (Detroit), Denver, Houston, Huntington, Indianapolis, Jersey City, Kansas City, Little Rock, Memphis, Minneapolis, New Orleans, Philadelphia, Pittsburgh, Portland (Ore.), St. Petersburg, Salt Lake City, San Francisco, San Gabriel (Los Angeles), Seattle, Syracuse, Washington, D. C. In Canada: S&C Electric Canada Ltd., Toronto and Montreal.

Added
S&C Switchgear
serves a billet
heater, furnace,
and load center,
and supplies
metering.



**rubber-insulated
LOXARMOR
CABLES
save space,
reduce cost**

Considerable interest is growing throughout industry in Loxarmor (interlocked armor) Cables for use in locations where the maximum protection of a rigid conduit is not required. Okonite's interlocking Loxarmor covering makes the cable flexible and easy to train (minimum bending radius 8 times cable O.D.) and at the same time provides mechanical sturdiness. Installation costs are lower than for rigid conduit systems, and Loxarmor's accessibility makes it easier and cheaper to re-route or add circuits. Its compactness provides important space-saving features where runs must be installed around existing plant equipment. Loxarmor coverings can be supplied in galvanized steel, aluminum, bronze or copper.

Okonite rubber-insulated Loxarmor Cables are insulated with Okonex, a butyl-base com-

pound applied by Okonite's famous strip-insulating process. Vulcanized in a metal mold, the insulation forms a solid dielectric wall which has better moisture resistance and electrical properties than laminated varnished cambric insulations. The superiority of Okonex is indicated by its higher insulation resistance, lower dielectric loss, lower power factor and lower specific inductive capacity.

Okonex-insulated Loxarmor Cables are suitable for operation up to 15,000-volts and at conductor temperatures up to 85°C. For complete information on Okonite Loxarmor Cables, including detailed splicing and terminating drawings and instructions, write for Bulletin EC1090. The Okonite Company, Passaic, N. J.



Available with either copper or aluminum conductors

OKONITE SINCE 1871 **insulated cables**



2976

MATCHED ENCLOSURES!

ALL THE FEATURES *plus . . .*



SQUARE D's NEW POWER-STYLE SWITCH BOARDS

DESIGN LEADERSHIP FEATURES

Distinctive Styling Features attractive, modern appearance matching the control center design.

Easier Installation because removable front and back plates expose generous wiring.

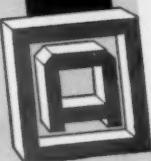
from ~~the~~ isolated horizontal wiring parts. Isolated horizontal trough has drop-off openings, assuring ~~the~~ wiring.

sales, neater winning.
flexibility. Complete sections or
units can be added or changed.

- Branch units can be used to meet specific job requirements.
- Scalar inspection and maintenance tasks are removed.

Front, side and back plates are removable, thus providing easy and immediate access to specific areas.

SQUARE D COMPANY



ASK YOUR

Welle for men.....
4041 N. Richards St., Milwaukee 12, Wisconsin
of 3 inches.

Special combination starters fit in a 20 ampere space.

Shamness and front without removing white...
front without removing white...
fishing.

**switches can be
doors.** **Automation Economy.** All wiring

Please note: complete sections can easily be removed or exchanged. Push the selector switch to the left to turn off lights, and selector switch to the right to turn them on.

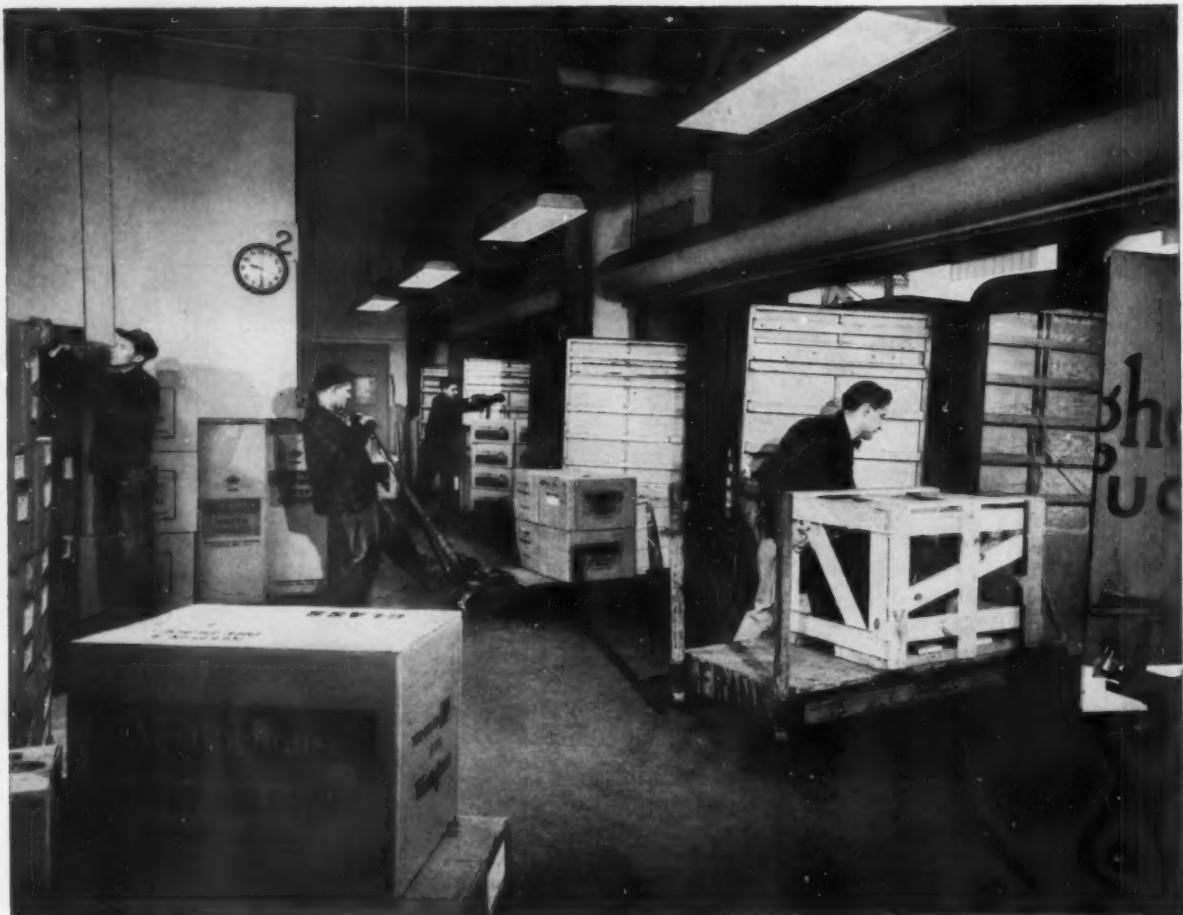
units . . . disconnect handle units . . . maximum operator protection.

DESIGN LEADERSHIP FEATURES

CONTROL CENTERS

SQUARE D's NEW





FACT: You Now Get Same-Day Delivery on 13,584 Electrical Items from Wesco

Now, from one dependable local source, WESCO ships over 85% of all orders the day they are received. This fact makes your jobs easier—and it also means you don't have to stock normal electrical maintenance and repair items.

Nationally Known Products

WESCO carries quality electrical products with names you know and trust—and backs this line with swift, dependable delivery to save you time and money.

Supporting this reliable delivery of this

country's finest electrical products is WESCO's ability to assemble specially trained personnel to solve any on-the-job problem you may have.

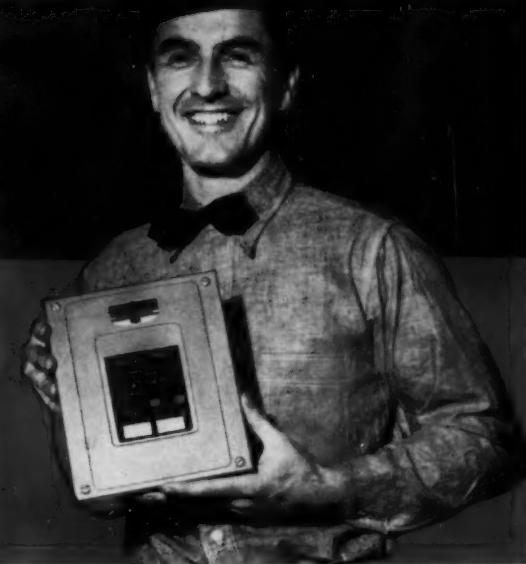
Call Locally

So, when you need electrical apparatus and supplies, call your local WESCO house—there are 118 of them conveniently located—and you can expect prompt, efficient service. See your Classified Directory . . . Look under Electrical Supplies, Wholesale and Manufacturer.

WESTINGHOUSE ELECTRIC SUPPLY COMPANY

**FAST PROTECTION
UNIFORM PROTECTION
COMPLETE PROTECTION**

**on ALL
current
values**



That's the difference—so get Cutler-Hammer Unit Breakers... Modern, Low Cost Circuit Protection

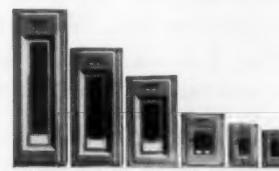
- The Cutler-Hammer Unit Breaker is everything and has everything you want in high quality, low cost, modern circuit protection. It provides convenience in stocking and it provides convenience in selecting the proper capacities for any home or any building. And in addition it affords complete, uniform, fast protection on all wire capacities within each Unit Breaker size range. No slow operation here and over-fast operation there, but uniform safe protection throughout. Get Cutler-Hammer Circuit Protection and you *provably* get the best.

CUTLER-HAMMER, Inc., 1306 St. Paul Ave.,
Milwaukee 1, Wisconsin



Basically 3 Components

The C-H Unit Breaker consists of case, individual circuit breakers, and cover. Easy to assemble, and install.



6 Cases—32 Circuits

Only 6 case sizes handle all needs to 32 circuits. Also raintight and special types available.

Rock Bottom Prices Plus These Features

Ambient compensated. No pre-tripping in hot climates. Thermal magnetic protection against heavy overloads and shorts. Compact, rugged, lasting, dependable. Quick make and break for long contact life. Famous C-H Quality.

for men who plan electrical installations and specify electrical materials and equipment...

COMING
IN
MAY:

YOUR MASTER ELECTRICAL SPECIFICATIONS ISSUE

a reference book of specifications paragraphs and wiring layouts for all types of occupancies

THIS NEW, revised, expanded reference book will cover every phase of interior electrical work — lighting, wiring, power applications, motors and controls, signalling and communications, electric heating.

Electrical contractors, heads of industrial electrical departments, consulting electrical engineers and architects will use it as a guide in planning and writing complete, concise specifications for every type of electrical wiring layout.

Electrical people can use such specifications to prove and sell the benefits of adequate electrical jobs . . . to raise the level of electrical work. Tight electrical specifications help the electrical contractor by establishing a high level on which all job bidding can be based. And if the specification level is high, the proportion of money going into electrical work will be high.

This May issue will present the equivalent of a full-size text-book on planning and writing electrical specifications. Wiring diagrams will illustrate details clearly. The issue will set high standards for exact

A limited number of extra copies of the Master Electrical Specifications Issue will be available at \$1 each. Send this coupon now, with your remittance, to make sure additional copies are reserved for you.

ELECTRICAL CONSTRUCTION AND MAINTENANCE
330 West 42nd St., New York 36, N. Y.

Name Title

Company

Street Address

City Zone State

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Enc. \$

HOW YOU CAN USE THE ISSUE:

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wording, and for checking the completeness of electrical specifications.

The previous Master Electrical Specifications Issue of EL. C. & M. was issued in 1952. After May, it will not be revised and reissued until 1958!

ELECTRICAL CONSTRUCTION AND MAINTENANCE

A McGraw-Hill Publication
330 West 42nd Street, New York 36, N. Y.





Duff-Norton Jacks and Coffing Hoists

*join to give you more complete lifting service
from one source!*

It seemed a logical move to combine into one organization the world's oldest and largest manufacturer of lifting jacks, Duff-Norton; and a leading producer of high quality hoists, The Coffing Hoist Company.

That's exactly what happened March 1 when Duff-Norton purchased The Coffing Hoist Company. Now, with the pooling of engineering skills and experience, the joining of sales departments and the combining of two complete lines of lifting tools, you can expect better service when it comes to lifting, low-

ering, pushing, and pulling jobs from either the floor or ceiling.

Josiah Barrett, the founder of Duff-Norton, invented the world's first ratchet lever jack in 1883. Today, the line of high-quality jacks includes some 203 different types and sizes of ratchet, screw, hydraulic, and air motor powered models from compact 3-ton capacity hydraulic jacks to giant 100-ton capacity air power jacks.

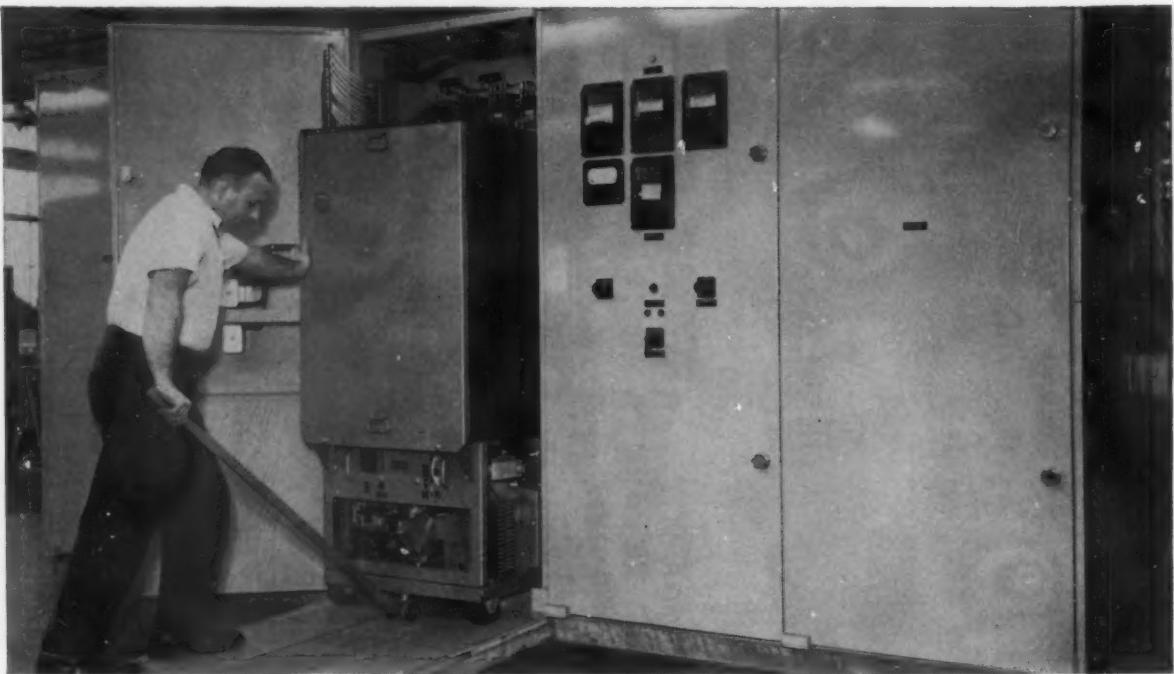
F. W. Coffing, who founded the Coffing Hoist Company in 1928, invented the first ratchet lever hoist

and also developed the first portable lightweight electric hoist. Coffing hoists are recognized as high quality, low maintenance products. The Coffing line includes over 100 different sizes and models from 500 pound to 25 ton capacities in ratchet lever, standard and lightweight spur gear, and electric hoists.

See your local distributor or write for complete details on jacks to the Duff-Norton Company, Pittsburgh 30, Pennsylvania. For hoists, write to the Coffing Hoist Division, Duff-Norton Company, Danville, Illinois.

Duff-Norton Jacks Coffing Hoists

Giving Industry A Lift Since 1883



Metal-clad switchgear. Horizontal drawout air circuit breakers in rigid, all-welded enclosures. Available in ratings from 2400 v through 15 kv—50 through 500 mva interrupting and 2000 amp continuous.

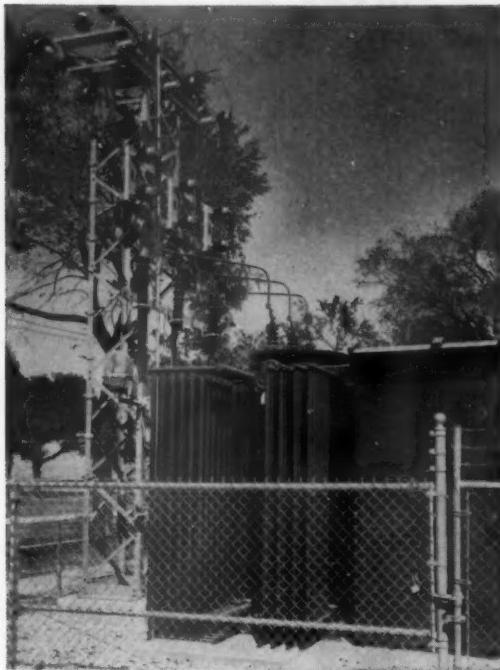
NEW CONSTRUCTION ECONOMY TIP:



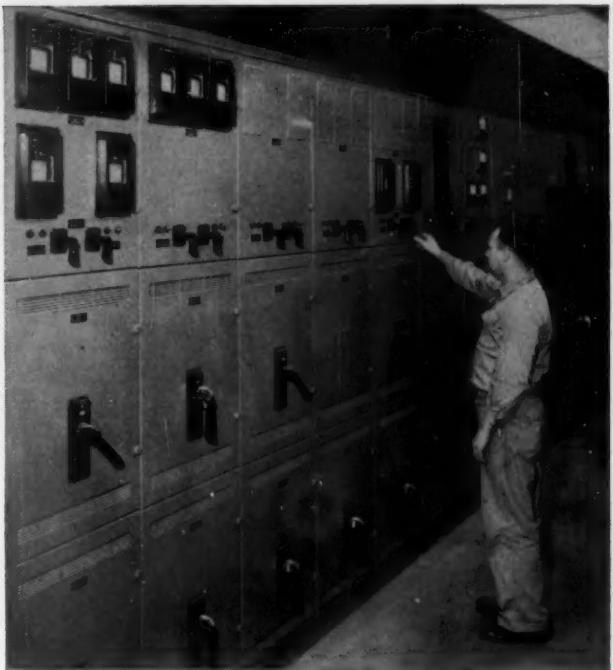
Isolated phase, metal-enclosed bus. For power generating stations. Available in ratings through 69 kv and 10,000 amp.



Nonsegregated phase, metal-enclosed bus. For switchgear connections. Available in ratings 600 v through 6000 amp; 5, 7.5 or 15 kv through 5000 amp.



Unit substations. I-T-E primary and secondary unit substations can be supplied for any application—indoor and outdoor—and in any standard rating.



Low voltage switchgear. For circuit protection. Commercial buildings, manufacturing plants, generating stations. Ratings through 600 v a-c, 250 v d-c, 6000 amp continuous, 15,000 through 150,000 amp interrupting.

BUY AN I-T-E "POWER PACKAGE"

Coordinated engineering, delivery and installation means a better investment

An I-T-E "power package" includes the complete power handling facilities you need for a new construction project, building addition, or simple expansion of electrical service—one unit or a complete system for every application from generation to end use. You save many ways:

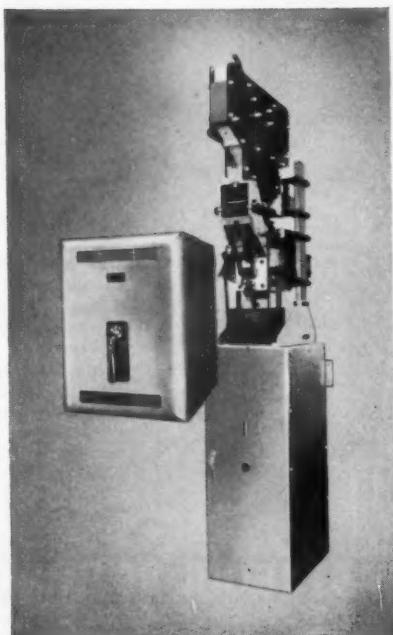
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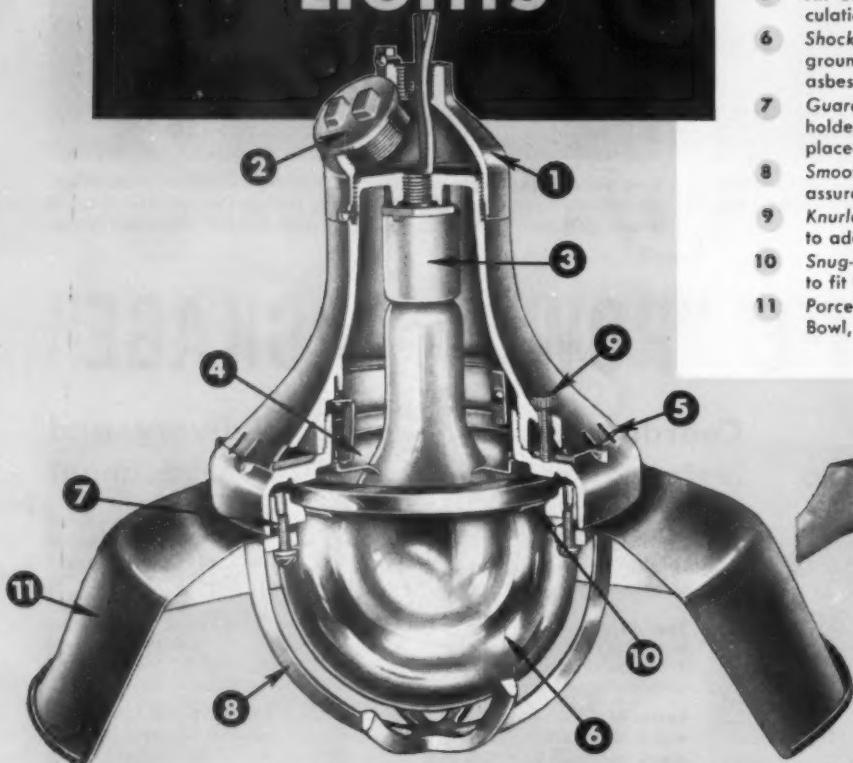


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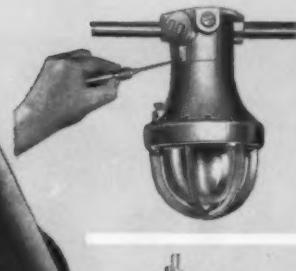
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WATTAGE QUICKLY
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 WITHOUT TOOLS

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3. Replace globe support assembly, tighten thumb screw.

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All-Electric Is Here Now

Very recent developments in air conditioning and in central program control can now be integrated with already available equipments for lighting and heating to make the all-electric building a thoroughly practical reality. All-electric is no longer a "some day" prospect. The parts and components are all on the market now, ready for the electrical contractor to select, combine, install and connect.

New built-in unit air conditioners designed to be installed in the wall with negligible projection in or out are the permanent versions of the familiar window unit. They require only mounting and connection to a properly designed wiring system. This is a development of very great importance to electrical contractors because air conditioning can now be a one-craft installation.

Even more important for the long run, the independent unit method of air conditioning is uniquely complementary to electric heating. Just as electric heat occupies no useful space and is, in effect, a heating "plant" completely dispersed through the building, so built-in unit air conditioning is a completely dispersed air conditioning "plant". And both can be served over the same wiring system.

Three independent lines of development have thus converged quite suddenly, almost accidentally. The electric ceiling, electric space heating and built-in air conditioning are each challenging opportunities for electrical contractors. Taken together and unified on a common electrical system the potential defies appraisal.

To cap it all, a fourth line of development has moved in to provide control. Dispersed systems inherently involve local control, difficult to operate if the functions must be programmed for changes in night, holiday and week-end operation. A new device provides a large number of remote control operations from a central master by pulses sent over the wiring system. It can control automatically to a preset program or provide for central manual operation of all parts of the system.

It sums up to this. Any electrical contractor in any community where electric space heating is accepted by the utility can now furnish and install a complete, one-craft, system of light, heat, power, ventilation, cooling and communication applied by unit components distributed throughout the building. The unified system is all built-in and occupies no useful space. It can function automatically with perfect zoning on local control with an over-riding central program and master control.

By these developments the electrical contractor occupies a position of pre-eminence among the so-called mechanical trades. He is the only available catalyst capable of bringing the parts together. He, alone, is in virtually complete command of the know-how and of the one essential skilled craft. The potential stakes are measured in billions of dollars.

Wm. T. Stuart



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tion? There's a Graybar-distributed unit specially designed to provide all the cool, refreshing air you want. And it's as handy to you as your nearest Graybar office.

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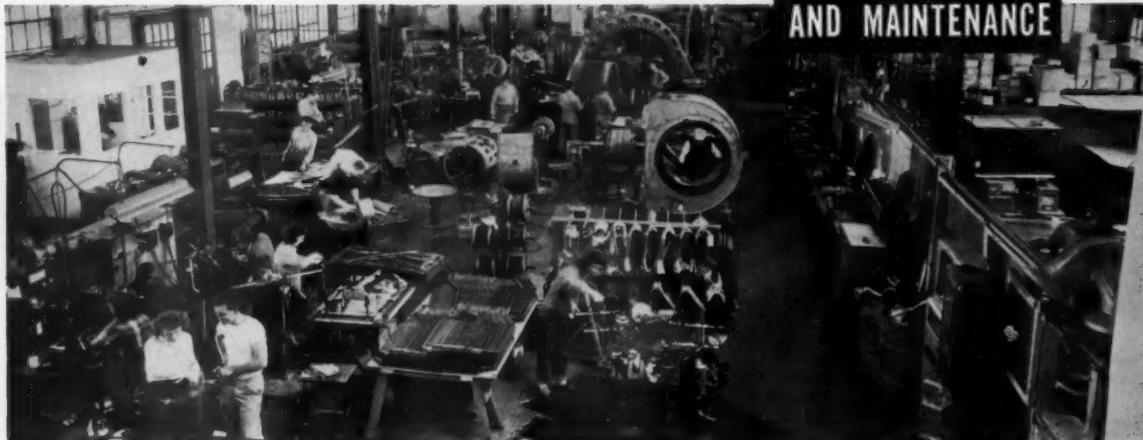
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IN OVER 120 PRINCIPAL CITIES



Larsen-Hogue Electric Co., Los Angeles. The shop's president is William M. Hogue, a past-president of NISA (1953-4) and general chairman of NISA's 22nd annual convention to be held at the Hotel Statler, June 6-10. George Larsen, vice-president, is program chairman for the Convention. Larsen-Hogue's several departments are run pretty much independently by their foremen. Coils are being taped at front left. Some of the large equipment the shop repairs can be seen in the middle of the photo. Side doors are used to bring equipment into the shop building.

Southwest Shops to

WELCOME NISA

A pictorial roundup of shops and shop methods in the Southwest where National Industrial Service Association members are preparing to welcome delegates and guests to the 22nd annual national convention scheduled for Los Angeles, Hotel Statler, June 6-10.



An elaborate testing board was built by Robert DeBerry of Pomona, Calif. (above), for the Pomona Electric Machinery Co., Pomona, Calif. The firm employs eight men in its repair operation, is located near one of the Los Angeles area's big aircraft manufacturing plants.



Portable light plants, 110/220-volt generators undergoing repair at the Marcus Electric Co., Glendale, Calif. These portable power generators are used by Los Angeles area contractors. The Marcus firm, operated by Bernard J. Marcus, above, has nine employees.



Outdoor stock at Lockard Motor & Pump Co. in Huntington Park, Calif., in the Los Angeles area. The firm has a large stock of medium-size equipment including a great many pump motors. Building in background houses additional stock and company office.

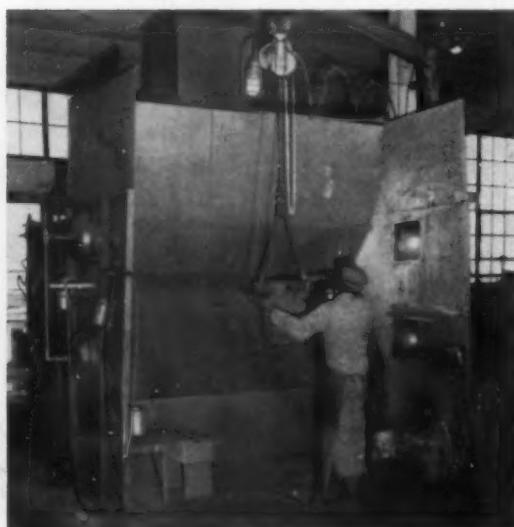


Art Watson, foreman of Smallcomb Electric Co. in Los Angeles, shows one of several testing devices he is installing on eight mechanics' benches in the shop. Box at left of his hand is for ground checking and one at right for checking starting switches.

Southwest Shops to Welcome



William Pompey of Pompey Electric Motor Service in Pasadena, Calif., shows his burnt-out oven, located outside his shop in a narrow areaway in back of the building.



Spray booth at Larsen-Hogue Electric Co., Los Angeles, largest shop in the area, employing about 100 persons. Water flows on back of booth as shown in this photo where employee is beginning to spray a transformer case.

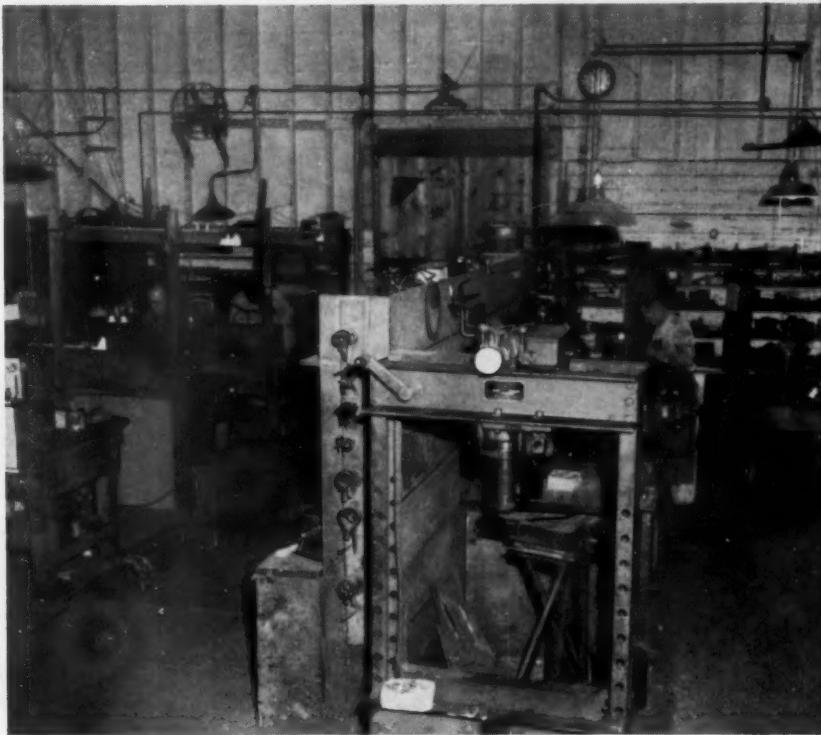


Lift trucks are used at Larsen-Hogue Electric Co., Los Angeles, to bring in equipment and to deliver it to trucks outside. California weather permits doors to be opened the year around according to sales manager Charles Doane.

NISA [Continued]



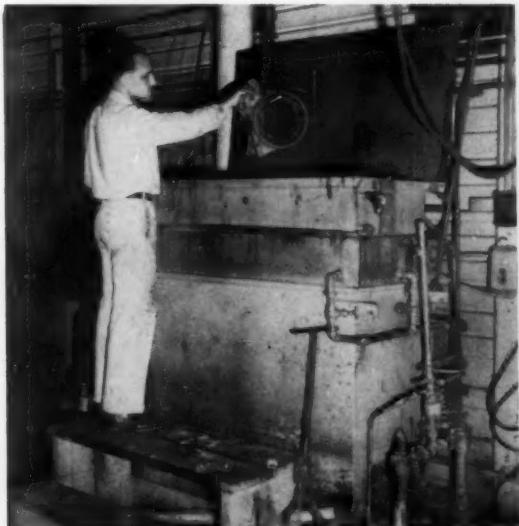
Owner Earle Sweinhart of Sweinhart Electric Co., Los Angeles, demonstrates his testing pit with calibrated weights for hoists. Pit is located on main floor of shop.



In the rear of Littlejohn-Reuland Corp.'s building, located on busy Santa Fe Ave., winders' benches at left are adjacent to machine shop at right. Littlejohn-Reuland is one of the companies taking an active part in the coming NISA Convention to be held in Los Angeles, June 6-10.



Truck used by Bear State has clever rigging device for handling equipment. Operating off the automobile battery, the entire frame, shown above near rear of truck, can be moved forward to end of truck bed.



This stripping tank at Hill Electric Co. in Los Angeles has a coil of cold water running around its outside and another similar cooling element around the inside, confining the heat to the area of operation.



Jim Blake, a superintendent at Hill Electric Co., Los Angeles, looks over the numbered boxes which the firm uses for each job. Motor, parts and other materials are placed in these boxes to facilitate repair work, much of which is done on warranty contracts for appliance motors.



Interior of burnout oven at Smallcomb Electric Co. in Los Angeles. Motor is loaded onto hoist and pushed over burner. Foreman Art Watson of Smallcomb says they have cut down burning time by two-thirds with this arrangement.

At Sweenhart Electric Co. in Los Angeles the winding department is located on a balcony which runs three-fourths of the way around the shop building. Hoist at top meets elevator (at right at the end of table) connecting with lower, main floor. Another hoist picks up on main floor to and from elevators.



Lawrence Zamboni of Zamboni Brothers, Paramount, Calif., writes an order in his parts department near the front of his recently modernized building. The company shop is undergoing complete overhauling in the rear of the building and expects to be ready to welcome visiting NISA conventioneers.



At Pomona, Calif., the Pomona Electric Co.'s dereeling device is demonstrated by foreman Phil Benjamin. The handle he is holding releases the large wheel containing 18 spindles for magnet wire.

With outdoor burnout oven at Bear State Electric Co. in Long Beach, Calif., is shop foreman George Willoughby. The company employs 16 men, is owned by partners George M. Hennigh and Harry D. Ridge. This oven is one of the two the firm uses; the other is located inside.



Pressure Taps Speed Elevated Highway Lighting



LIGHTING STANDARDS support 400-watt mercury vapor luminaires; transformers are enclosed in base.

CONSIDERABLE time was saved wiring the lighting standards of the new South Street Elevated Highway in New York City through the use of recently developed Crimpit compression-type connectors.

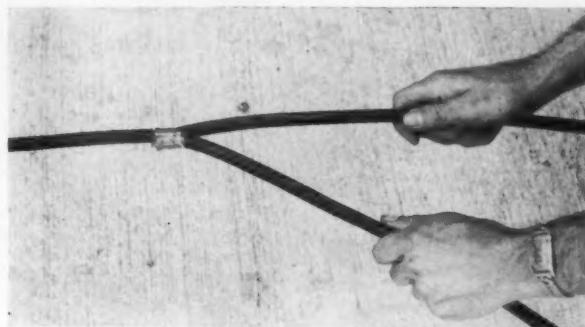
The new connectors were first demonstrated to Charles F. Zweifel, electrical contractor of New York, after he had begun work on the project. He quickly obtained necessary approval to switch to their use for tapping the standards to the main feeders.

Twin-arm standards, each supporting two 400-watt mercury vapor luminaires, extend the entire length of the 1.7-mile elevated structure, the last link in the peripheral system around the lower end of Manhattan. Main feeders are No. 2 conductors in 2-in. conduit, encased within a concrete island down the center of the 6-lane highway.

Feeders to the standards originate in control panels mounted between beam flanges beneath the roadway and fed directly from utility manholes. Since the luminaires are controlled by an astronomical time switch, a separate No. 2 conductor is included with the 3-phase, 4-wire, 120/208-volt feeders to assure available power at each standard 24 hours a day for maintenance purposes.

Use of the pressure connectors instead of the soldered connections called for in the specs made it unnecessary to cut the No. 2 mains. Connections were made to each standard in 24-by 12-by 12-in. cast iron hot-dipped galvanized pull and splice boxes recessed into the concrete island.

To splice the No. 6 conductors from



CRIMPIT pressure connectors permitted splicing without cutting into main feeders.



CONNECTIONS to each standard were made in pull box, shown here before pouring of island.

the standard to the No. 2 feeders, approximately 1 inch of insulation was removed from the end of the No. 6 and from the point on the No. 2 that the splice was to be made. The C-shaped Crimpit was then placed over the bared portions of the two conductors, perma-

nent connection being made by a 12-lb manually operated hydraulic Hypress tool developing 9 tons of pressure.

Time saved on the more than 300 connections required has "sold" the method to this contractor and seems destined for greater use on future jobs.



WIRING A SYMBOL OF SAFETY

Underwriters' Laboratories, Inc., synonym for public protection for six decades, has just moved into a new research and testing laboratory in Santa Clara, Calif. Combining all of the standards that the UL label stands for, this building possesses one of the finest electrical systems in the country—a system reflecting the tops in engineering and workmanship. Electrical contractor on the job was Roy M. Butcher.

By Hugh P. Scott

UNDERWRITERS' Laboratories' new testing center—like the UL label on an approved electrical product—represents the highest standards of safety. Covering approximately 32,000 sq. ft., the structure is a completely fire-retarded concrete-and-steel building, with metal doors and cabinet work, glass fiber sound insulation, and fire control dampers in the air conditioning ducts. And, designed for future expansion, the structure utilizes modular construction to a considerable extent in both office and laboratory areas.

The testing center is also outstanding electrically, for it has an extensive distribution system consisting of trenches, cellular flooring and wall raceways; it features special transformers and tap-changing apparatus, and it provides scores of different voltage levels for all types of electrical testing.

Transformers serving the building are three in number: a 500-kva delta-wye tapped test unit, a 300-kva 3-phase "house" transformer (related to lighting, office equipment, air con-

ditioning, heating and normal motorized operations), and a 100-kva single-phase test installation. All transformers are self-cooled pyranol immersed types. They are individually mounted on separate extra-depth concrete floorslabs to isolate hum, and their primaries are all at 4160 volts. Secondary power from the 100-kva 3-wire test unit is 120/240-volt; that from the 300-kva 4-wire unit is 120/208-volt, while that from the 500-kva test unit is 660-volt (full rating), with reduced-voltage taps providing 600, 575, 476, 465, 440, 244, 232, 220 and 208-volt phase-to-phase. In addition, phase-to-neutral connections on the 500-kva unit provide additional voltage levels of 381, 347, 332, 275, 268, 254, 141, 134 and 127.

This tapped 500-kva test transformer has a total of 34 bushings, making it necessary to locate them on the side of the tank to obtain sufficient mounting space. Of that total, three bushings are used to obtain the 660 full-winding voltage, one bushing provides a connection for the low-voltage neutral, while the remaining 27 provide 3-



MODERN FIREPROOF BUILDING has partial upper floor for employee rest and recreational purposes. Rear wall of building may be removed if future expansion demands larger testing area. Ornamental roadway lighting standards, groups of PAR lamps along roof parapet and special luminaires in entrance canopy are part of overall lighting plan.

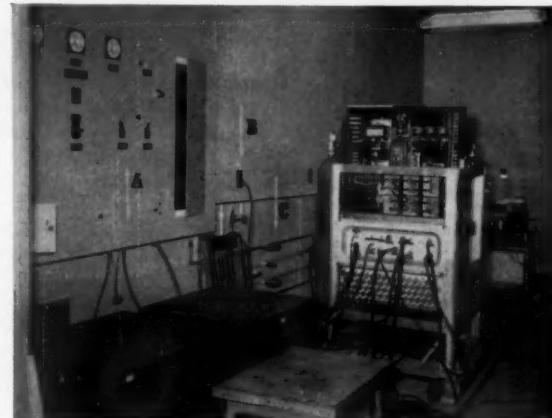


SERVICE CORRIDOR in completed state shows main distribution and tap-changing board, top-lighted by fluorescent strip, half straddling concealed floor trench. Also seen are 500- and 300-kva transformers, auxiliary power panel and m-g sets, dc generator for testing, overhead busduct and pullboxes.

phase ties at each of the reduced-voltage steps.

Conductors (from these secondary bushings to the 45-ft.-long low-voltage switchboard that straddles an 18-by-35-in. utility trench in the service corridor) are carried overhead through a king-sized wiring raceway which is supported not only by the transformer structure but by roof-anchored hangers as well. Secondary conductors from the other two transformers to the switchboard are via rigid steel conduit runs beneath the floor.

The secondary switchboard (the front of which is top-lighted by a continuous slimline fluorescent installation operating at 430 milliamps) is a composite of nine varying-width separate sections, each section segregated by solid barriers. Access is from the rear of this free-standing totally-enclosed assembly, while the overhang above the deep utility floor trench permits easy routing from any of the secondary cubicles to any segment of the versatile inter-plant distribution system.



TEST PANEL (A), recessed wireway serving electrical wall outlets (B), and valves for piped air, oil, gas and water (C), are provided in this "wet room" where any item requiring water (such as the pictured water-cooled arc-welding set) is tested.

Since the founding of Underwriters' Laboratories in 1894, more than half a million items have been tested for safety by this organization, and over 600 million UL labels have been distributed to the 4000 American manufacturers who voluntarily have submitted their products for inspection.

Tests have been severe—with fires purposely started to check the effectiveness of insulation . . . motors purposely operated in explosive atmospheres to test methods of sealing enclosures . . . household heating and electrical appliances misused and abused to prove them foolproof . . . TV screens and vacuum tubes deliberately shattered to see exactly how glass fragments fly . . . electrical apparatus purposely short-circuited to study breaker characteristics, and many materials subjected to oven temperatures of over 2000 degrees to verify their fire-retarding characteristics. All tests have a common objective: to protect the public by ferreting out potential hazards and recommending corrective changes.

Underwriters' Laboratories is strictly a non-profit service organization, yet it is completely self-supporting, enjoying the sponsorship of the National Board of Fire Underwriters and operating on the modest fees paid by American industry for investigating, testing and listing approved materials, devices and equipment. With three testing centers (San Francisco, New York and Chicago) and with representatives in over 200 cities, UL is making a gigantic contribution toward the safety of 20th-century living.

This latest testing center in Santa Clara is one of the finest jobs in the country. Codes and Standards have been used as starting points for quality, rather than as ultimate goals. And all engineering, equipment and workmanship related to the installation reflects top-flight cooperation between electrical contractor Roy M. Butcher of Santa Clara, the engineering staff of Underwriters' Lab, Harold L. Gerber of the Coddington Company of San Francisco (electrical consultants), and The Austin Company of Oakland, builders.

VOLTAGE TRANSFORMATION AND SELECTION

THIS switchboard assembly is of more than usual interest for it comprehensively includes switch gear related to all "house" power, lighting and heating; a pair of motor-generators and all associated dc apparatus; an auto-transformer tap board, plus a specially designed tap-changing section linked to both the 500-kva 3-phase and 100-kva single-phase test transformers.

The tap-changing section is a 10-ft-wide assembly, across the top of which are three voltage-selection panels (each panel related to a separate phase), and across the bottom of which are located a series of nine circuit breakers, four at present being reserved as spares. The other five controlling feeders run to a 50-kilowatt dc m-g set, a three-phase auto transformer, and test panels variously located in a burn-out room, wet (rain) room and switch testing area.

Basic construction of voltage-selection panels incorporates two series of

bus bars: a vertical series of 32 bars being connected at the top to various bushings of the 500- and 100-kva test transformers, and a horizontal series of 15 bars (five on each of the three separate phase panels) being connected at the bottom to lugs on five of the feeder breakers.

These two series of bus bars are segregated from one another by thick ebony asbestos barriers, although these panels (and the bars as well) are pierced wherever bars of the two series are opposite to one another. Into these drilled holes, connection bolts (attached to insulated handles) may be inserted, thereby providing current transition mediums between any stepped-voltage level and any specific feeder breaker. The entire voltage-selection panel is faced by a 10-gauge steel facing sheet, through which the insulated handles protrude for dead front, foolproof convenient positioning.

Primary 3-phase 3-wire service at 4160 volts is initially brought into the

structure underground by means of three single varnished-cambric lead-sheathed conductors carried in rigid steel conduit—these feeders terminating in cabinet-type hermetically sealed potheads housed in the metering section of a primary indoor metal-clad vertical-lift high voltage switchgear assembly. Power then continues through an electrically operated 1200-amp main breaker to a common bus structure which serves three transformer-feeder breakers (at present), with space, connection provisions and copper capacity provided to serve an additional feeder if future building expansion so dictates.

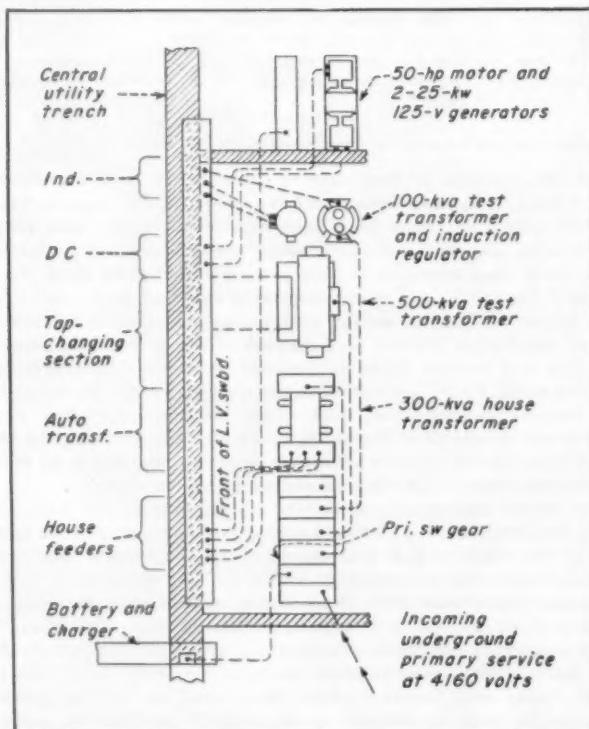
In this primary switching center the main breaker is equipped with a removable 3-pole breaker element, trip-free dc solenoid-operated control mechanisms, both primary and secondary disconnects, breaker position indicators and interlocks to insure that the breaker is in the "open" position before being raised or lowered. Also included is an automatic shutter that closes the entrance to the primary disconnection when the element is lowered to the "removable" or "test" position. When raised, the element makes positive line contact, with a stud-and-socket silver-to-silver pressure unit employed for that purpose.

Switchgear buses are segregated in a separate metal compartment and are individually insulated by means of molded high-dielectric sleeves. Again, joints are silver-to-silver, the bus joints being encased by compound-filled 2-piece molded insulation jackets.

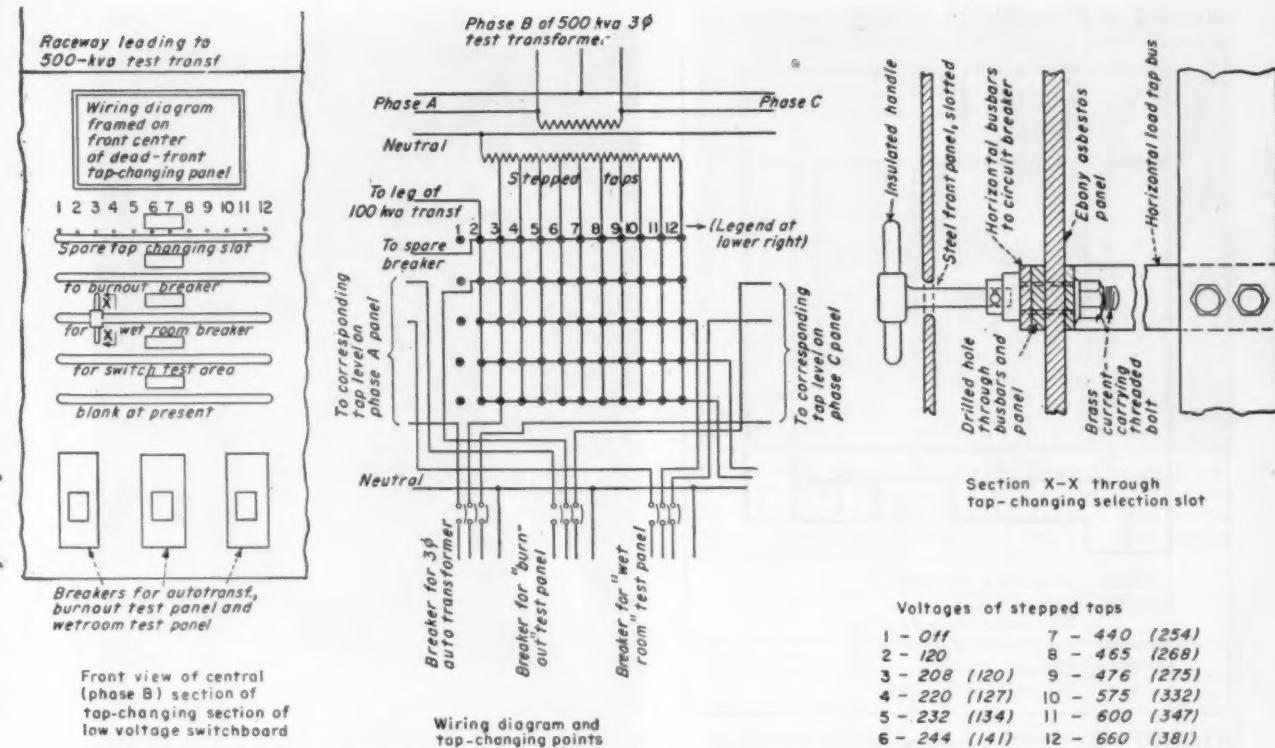
Like the main breaker, all of the three feeder control breakers are electrically operated drawout units, with red and green indicating lamps showing the position of switches, and with all secondary and control wiring completely shielded. All relays are removable, with testing facilities.

Grounding of switchgear is initially to a bus bar which is bolted directly to the switchgear framework, this bus occupying the position originally filled by the rear shipping channel.

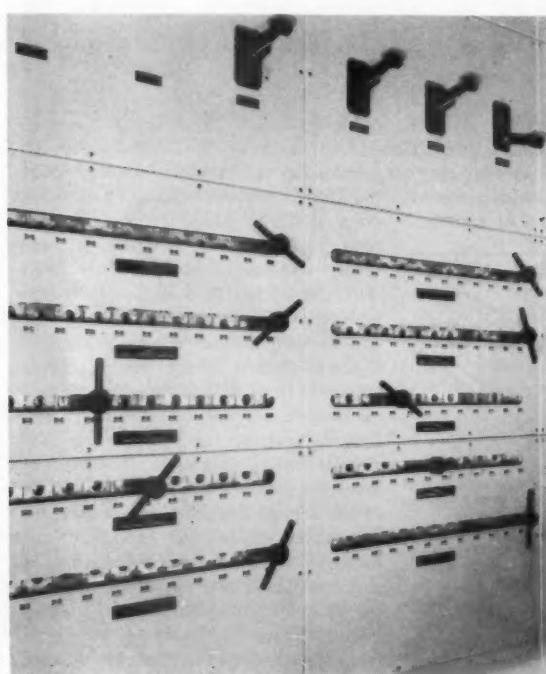
Adjacent to, but separate from this primary switching assembly are the station's 125-volt dc control battery and charging units—the battery having an operating capacity to activate all switchgear simultaneously, and the static-type charger having a charging rate of 2-10 amps.



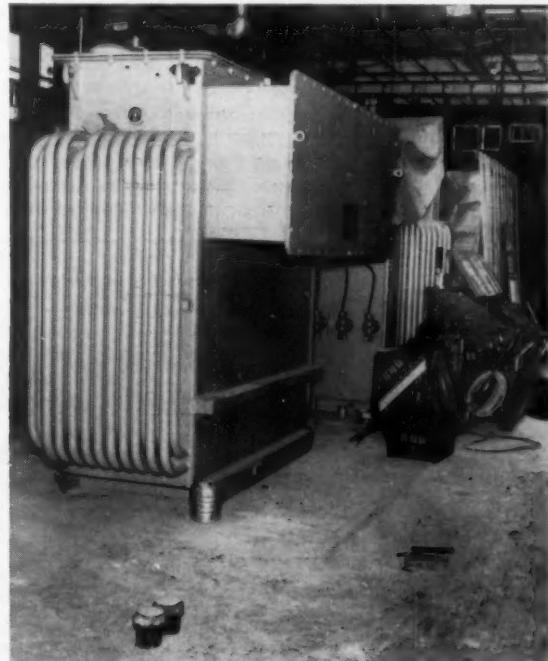
SERVICE CORRIDOR, centrally located nerve center of the building, contains all 4160-volt primary switchgear, three transformers, an m-g set, induction regulator, air conditioning equipment and 45-ft-long low voltage switchboard that partially overhangs the main utility trench.



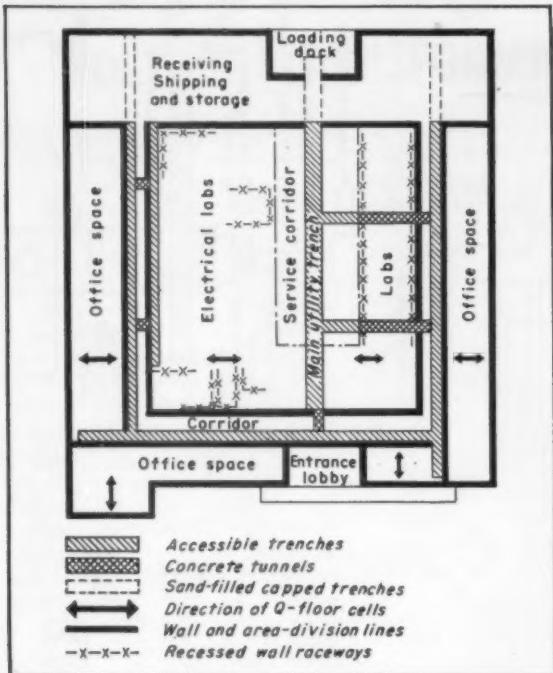
Voltages of stepped taps	
1 - Off	7 - 440 (254)
2 - 120	8 - 465 (268)
3 - 208 (120)	9 - 476 (275)
4 - 220 (127)	10 - 575 (332)
5 - 232 (134)	11 - 600 (347)
6 - 244 (141)	12 - 660 (381)



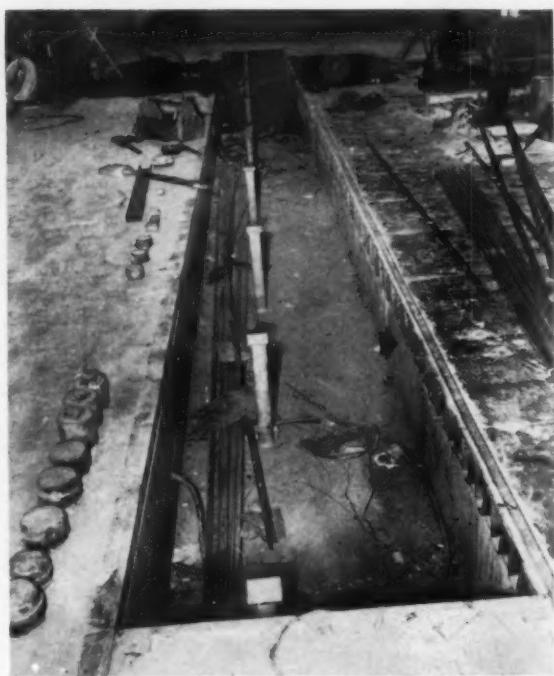
VOLTAGE SELECTION is facilitated by connection bolts that link series of bus bars positioned at right angles to one another in different planes. Shifting the insulated bolt handles and tightening them by spinning provides voltage at any desired level for any feeder serving a testing area.



500-KVA TEST TRANSFORMER has special compartment on upper side of tank that encloses 34 bushings connected to the transformer's secondary stepped-voltage taps. Connections from these bushings are carried to a special tap-changing section on the main switchboard.



FLEXIBILITY OF WIRING is obtained through extensive system of trenches, tunnels, cellular flooring and wall-recessed raceways that serve all sections of the building.



CENTRAL UTILITY TRENCH runs through service corridor. Open ends of Q-floor cells (right) permit routing of feeders from this trench to any point in vicinity of the board.

TRENCH, Q-FLOOR AND WALL DISTRIBUTION

FROM the low-voltage switchboard in the central service corridor to the most remote outlet in the building, the objectives of both flexibility and accessibility have been consistently met through the installation of an interconnecting network of floor trenches, metal floor cells and wall-recessed raceways.

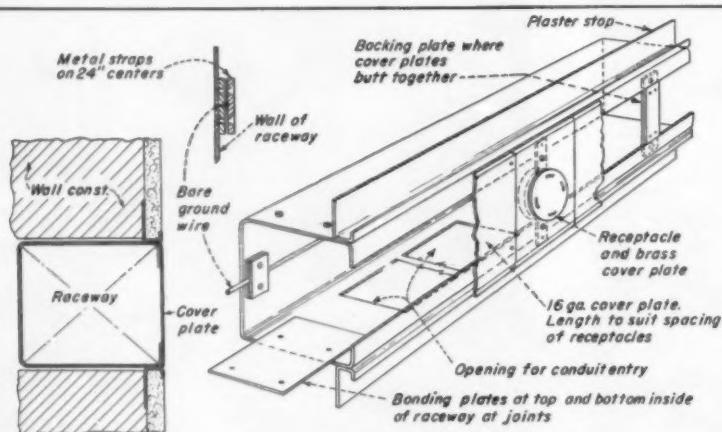
Main trunk of this distribution system is the central utility trench that passes beneath the low-voltage switchboard and which extends the full length of the service corridor. Branch trenches at right angles to this artery carry power and signal system raceways to the north and south sides of the building, then additional trenches

run parallel to the main trunk to provide further facilities for reaching all sections of the structure by this initial means. Numerous drains are provided.

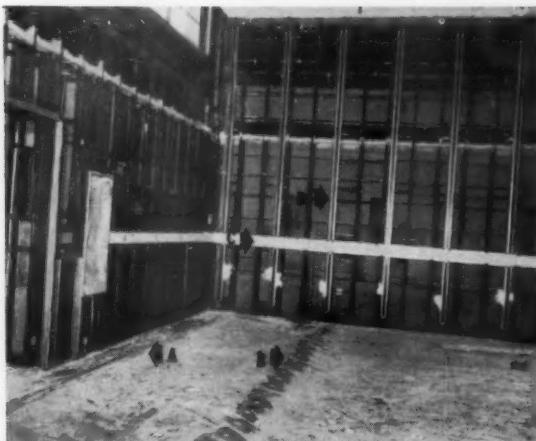
Since it is anticipated that the testing center may be expanded in the future and that some areas now used for storage may eventually be used for office or lab purposes, trenches also extend beneath these sections. These trench extensions are presently filled with compacted sand and capped with temporary 5-in. concrete slabs which can be drilled clear when required.

Cross section of the central utility trench is 18 by 35 inches, with separate raceways for telephone, power and lighting wiring occupying approximately half of this area. These raceways are continuous for the full length of the service corridor, are completely segregated from one another, are formed from 16-gauge galvanized sheet steel and are supported clear of the trench's concrete floor by angle-iron framework. Access to wiring is from above, while bottom weep holes keep raceways free from moisture.

Branch trenches are also of 16-gauge galvanized metal, held clear of the concrete floor by means of steel saddles on 2-ft centers. In cross section, however,



RECESSED WALL RACEWAYS are fitted with bare ground wire and receptacles that provide both 120 and 240-volt ac, 125 and 250-v dc. Receptacles were positioned along the open-front raceway as needed, then intermediate cover plates were dimensioned individually to conform to this spacing.



FLEXIBILITY OF DISTRIBUTION is obtained through capped trenches (A) that run alongside of lab, closely spaced outlets (B) giving access to floor cells, and metal raceways (C) recessed into walls. Unistrut members (D) also recessed into walls, offer mounting provisions for all equipment.



WAIST-HIGH RACEWAYS, recessed into steel stud and metal lath lab walls, are served from below through feeder stubs rising from floor cells or trenches.

these branch trenches are considerably smaller than the main trunk, measuring approximately 8 by 9 inches with two-thirds of the enclosure occupied by power wiring and the remaining third serving the signal system. These two channels are segregated, yet crossover nipples and bushings make it possible to enter one compartment without disturbing the other (see accompanying sketch). Trenches now in service approximate a gross distance of 700 feet, while sand-filled extensions give an additional 200-ft potential.

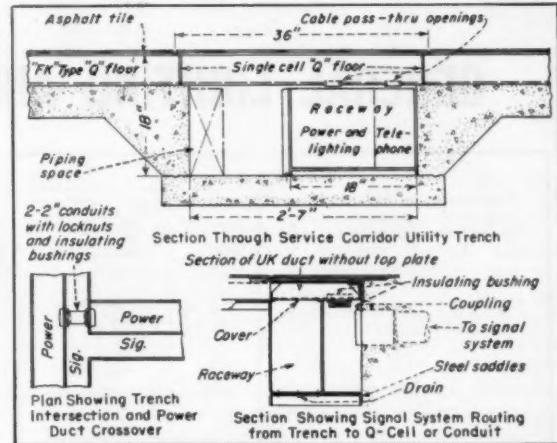
The second order of distribution in the building consists of Q-floor ducts, installed at right angles to the various trenches so that wiring connections between these two wiring mediums can be made at any desired lateral. Connections are downwards from Q-cells to floor trenches through insulating

bushings, while connections to floor outlets, wall panelboards, wall raceways, test benches or free-standing power equipment is via the usual assortment of floor taps and enclosures, cell ells and conduit connectors. Q-cells normally stop at the edges of the main utility trench in the service corridor, but short sections of removable single cells can be used to bridge the trench.

In many of the research and testing labs, a third method of distribution is via flush metal wall raceways (dimensioned at 5 by $4\frac{1}{2}$ inches) that extend completely across some of the wall sections, being capped by end terminals when within 6 inches of a doorway. These wall raceways (connected to floor distribution raceways by conduit risers) are each fitted with a 6-gauge hard-drawn bare copper grounding wire secured to the rear of the channel

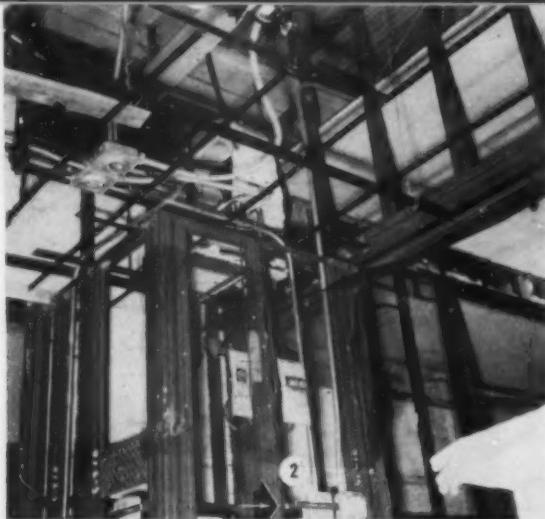


CONTROLLED TEMPERATURE test room is equipped with floor cells, wall raceways and vertical Unistrut mounting strips, then is thoroughly insulated with glass wool battings installed behind fire-retarding metal lath and perlite gypsum plaster covering on walls and ceiling.

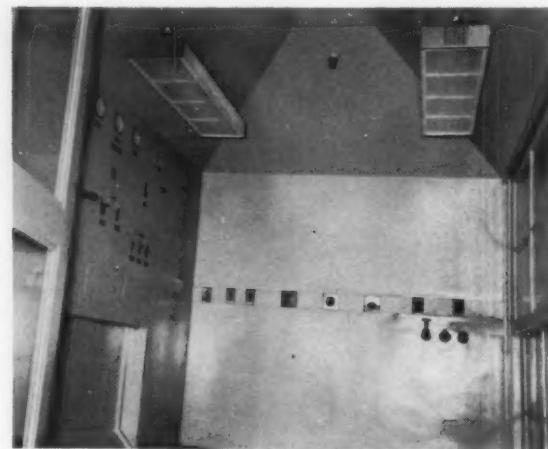


SECONDARY DISTRIBUTION is initially through Q-floor cells and trenches that are partitioned to segregate signal wiring from power or lighting feeders.

by supporting clamps on 2-ft centers and connected to the building's water system every 50 feet. Receptacles (mounted on individual brass cover plates) are positioned along these wall raceways as desired, then the intervening distances between receptacle plates are filled by sections of 16-gauge cover plate, cut to varying lengths to suit the spacing of individual receptacles. This results in a smooth, uniform, continuous installation, with all wiring readily accessible and with the provision for revising the receptacle arrangement at will. Receptacles associated with these wall raceways are mainly used to provide 15-, 30- or 50-amp, 120- or 240-volt ac plus 15- or 30-amp, 125- or 250-volt dc. These same power provisions, plus regulated ac (between 85-155 volts), are available on test benches.

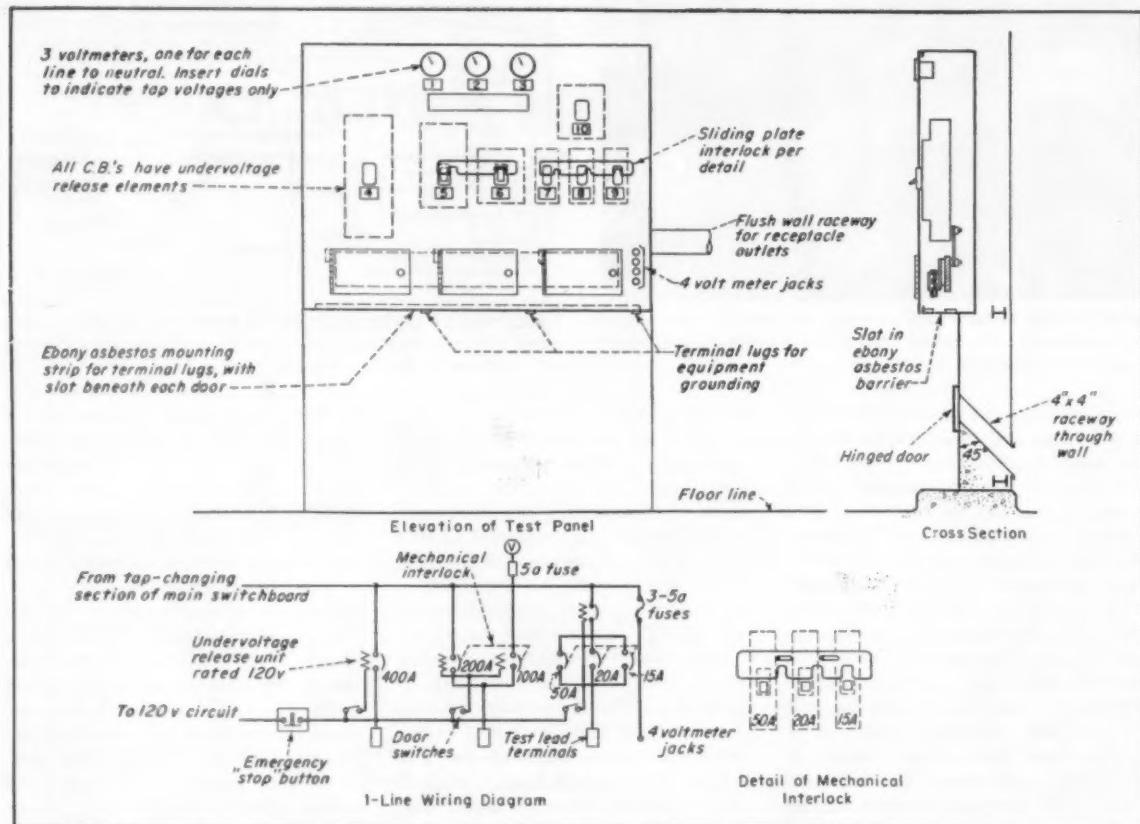


PRACTICAL DETAILS of installation included (1) spot-welding pipe nipples to steel framing members, thereby making it possible to secure flexible conduit without damaging flex armor by applying excessive heat, and (2) mounting switch-boxes in thinwall partitions side by side in the same plane (although facing in opposite directions).

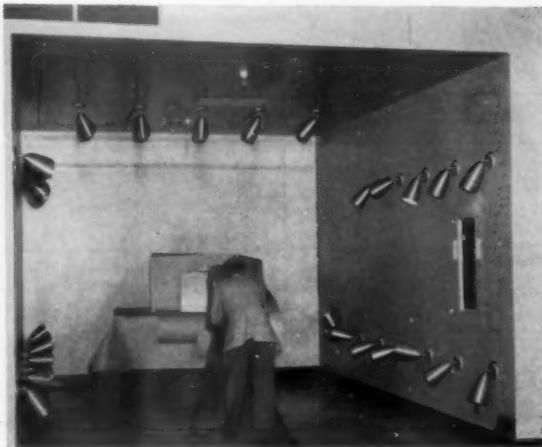


BURNOUT ROOM (where electrical equipment is operated to the point of destruction) has its own electrical test panel, an assortment of duplex outlets for various currents, taps for water and gas, a high-capacity smoke exhaust system, high-intensity lighting, sprinkler facilities, insulated walls and wired-glass doors.

GENERAL LIGHTING AND POWER APPLICATIONS



TYPICAL TEST PANEL has assortment of circuit breakers (each with a different ampere rating), thereby making it possible to select current-limiting protection to conform with magnitude of current required during a specific test. Mechanical interlocks prevent simultaneous closing of adjacent switches, while inclined raceway (passing through wall directly beneath panel) permits routing of take-off conductors to another room with minimum bending of the cables.



PHOTOGRAPHIC BAY (where all product samples are photographed before and after testing) is equipped with variety of adjustable floodlights plus wall receptacles for portable spotlights or other auxiliary electrical equipment. Panel in wall at right controls all circuits, while fully equipped modern darkroom is located just to left of bay. Ceiling curtain track is for drapes or cyclorama, while recessed Unistrut sections in rear wall facilitate mounting of equipment.



CEILING COFFERS for lobby lighting fixtures are of 3-hour fire-retarding construction. The fully recessed fixtures in this area are Skylike units with 300-watt silver-bowl lamps. Coffers are entered by branch conduits while ceiling expanse between fixtures is pierced by junction boxes and sprinkler heads. Throughout the entire structure, the design, selection of equipment and quality of workmanship reflects the high standards of U. L. engineering.

THROUGHOUT the entire center, local panelboards are breaker units of either instantaneous or time-limit types. Switches, controlling circuits for such devices as time clocks, synchronous clocks, heating controls, etc., are locked close to prevent manual disconnection, yet the barriers permit automatic tripping under over-load conditions. Where panelboards are wired with conductors larger than 8 gauge, connections are via pressure terminal lugs.

In no instance is wire for power or lighting less than No. 12, with Type R and T used generally and Types RW and TW installed in damp or underground locations. All circuit wiring is color coded, and identification is also insured by means of adhesive labels in junction and pull boxes as well as in panelboard gutters.

All conductors are carried in raceways, galvanized heavy-wall rigid conduit being used in concrete slabs, and EMT being installed when surrounded by air where completely accessible and where approved by local inspectors. Conduits not embedded in concrete are supported at intervals not exceeding 10 ft, and they are secured to cabinets, pull boxes, etc., by means of double locknuts and approved terminal fittings. Flexible conduit is used to carry motor leads or to facilitate the connection of recessed lighting fixtures to a governing raceway.

Lighting treatments are as many and varied as the functions of in-

dividual offices, laboratories, special purpose areas, recreation rooms and reception lounges. This variety is also noted outdoors, where floodlighting units light a parking area, an exterior building sign, an ornamental pool at the entrance, and the attractive canopy that partially spans the front of the building. This outdoor installation is independently wired and switched, with operation governed by a time clock.

Office, corridor and reception areas combine both recessed and surface-mounted incandescent and fluorescent lensed and louvered luminaires, while special additional fixtures and switching arrangements are found in a photographic studio and darkroom and in various wall-recessed display cases.

Except in hallways (where lighting intensities average 35 footcandles), no area in the building has less than 50 fc of illumination. Offices and labs, in fact, go up to 80 fc by strictly artificial means, while daylighting through windows and skylights adds an extra 30 or more footcandles to these critical-seeing areas under normal daytime conditions.

Wherever lighting fixtures are recessed, the coffers are of 3-hour fire-proof construction. Due to the cost of this type of construction, however, recessed units are in the minority, and lighting is mainly from surface-mounted or suspended fixtures.

Other features of this testing center include an electric-hydraulic truck

ramp that inclines upwards or downwards when truck tailboards are not level with the shipping platform; an underfloor sawdust suction exhaust duct that shunts sawdust from the woodworking shop directly to an enclosed collection bin; electric radiant baseboard in the constant temperature room; plus separate wiring systems for paging and public address, protective signalling, and control wiring for synchronous clock operation.

Modern installation methods include the use of powder-activated stud-guns (to secure outlet boxes to concrete), power hack saws (for cutting conduit and bus bars), electric threaders and reamers, power drills of all sorts, motorized hoists and sectional scaffolding. Construction details also included the liberal use of Unistrut to provide continuous mounting flexibility for lighting fixtures or other electrical equipment, while double-hung hollow-metal sliding wired-glass windows (between two burnout rooms) make it possible to double the size of a test area when necessary or desirable for testing purposes.

In summary it may be mentioned that the electrical part of the total construction cost approximated 15% and, when considering the serviceability of the center as a whole, that 15% can be translated into years of continued dedication in behalf of analytical study, critical testing and resultant promotion of safety for the protection of life and property.

POINT EVALUATION OF JOB CONDITIONS

	0	1 POINT	2 POINTS	3 POINTS	4 POINTS	5 POINTS	5 POINTS +
Mounting Height	Under 12 ft.	12 to 14 ft.	14 to 16 ft.	17 to 20 ft.		Over 20 ft.	+ 1 pt. for every additional 3 ft.
Fixture Wiring	Continuous mtg., single switching	Individual mtg., single switchings or cont. mtg., multiple switching	Individual mtg., multiple switching				
Fixture Supports	Concrete inserts or powder driven studs or beam clamps	2 machine-drilled anchors	3 machine-drilled anchors	4 machine-drilled or 2 hand-drilled anchors		3 hand-drilled anchors	4 hand-drilled anchors - 6 pts.
Fixture Hangers	Surface mounted or troffer*	Std. length stems or chain	Dropped beam ceiling - cut & thread some stems	Irregular ceiling - cut & thread all stems			
Assembly of Fixture	Basic unit, no separate panels or louvers	Well designed unit, separate panels and/or louvers	Economy unit, separate panels and/or louvers				
Lamping	Installed with fixture	Installed after fixture is hung					
Total Fixtures	Over 150	80 to 150	50 to 80	15 to 50	8 to 15	4 to 8	1 to 3 - 6 pts.
Transfer of Units from Delivery Point to Installation Point	Same floor, average distance - 75 ft.	Same floor, average distance - over 75 ft.	Multi-floor job, elevator, horizontal distance - to 75 ft.	Multi-floor job, elevator, horizontal distance - over 75 ft.		Multi-floor job, no elevator -	+ 1 pt. for each two floors of the median level.
Space Conditions	New construction - mostly large, open areas	New construction - mostly small rooms	Furnished premises, vacated during job			Furnished premises, occupied during job	Add 1 pt. if rolling scaffold cannot be used
Grade of Labor	Excellent	Very good	Good	Average		Poor	

*Separate allowance should be made if frame installation is not included in fitter's contract or if electricians will install frames.

NEW LABOR UNITS FOR . . .

Fluorescent Fixture Hanging

By John P. Reynolds

SELECTION of accurate labor units for fixture hanging has long been a headache to the electrical estimator. As the importance of this item continues to grow—it now accounts for 25% to 35% of total labor on a typical job—the need for precise units becomes more incessant.

Heretofore the most common method of evaluating labor costs for fixture installation has been to work from a concise table of units either developed from personal on-the-job time studies and work reports, or obtained from an outside source.

These tables generally list fixtures according to the type of unit: industrial, commercial, troffer, with and without louvers. Further break-downs

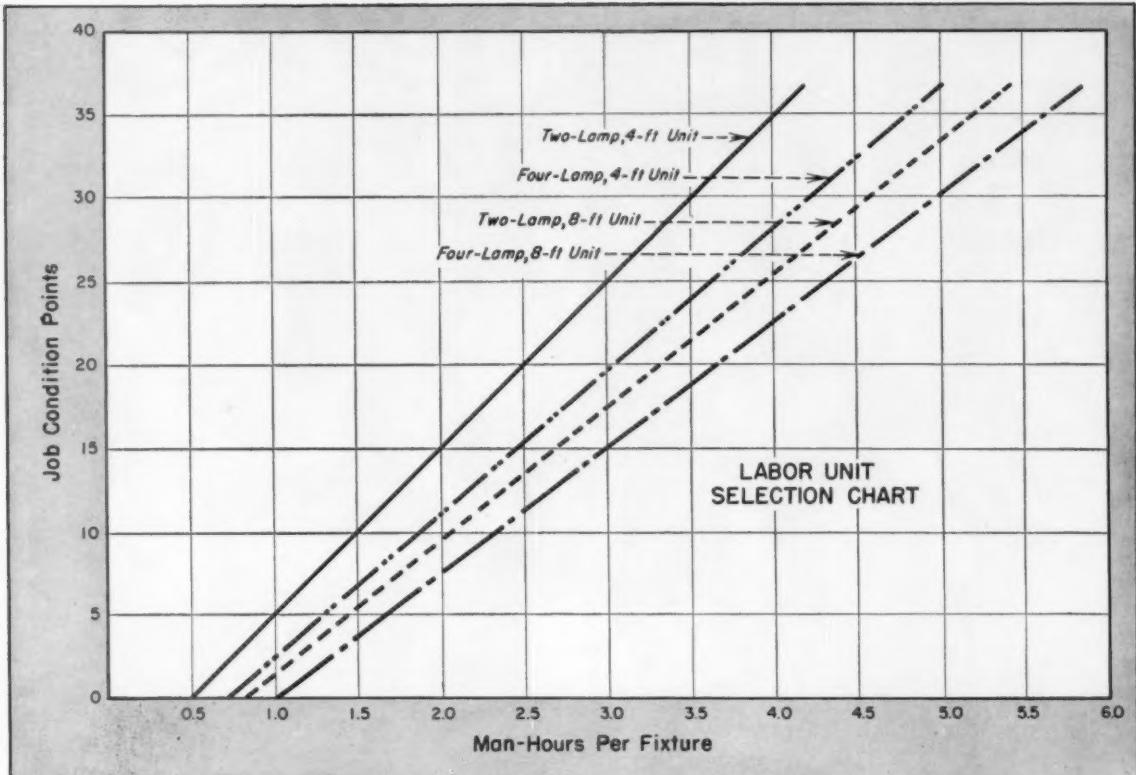
are made according to the number and size of the lamps which the fixture uses. Two or three labor units are usually offered to compensate for variations in mounting height. The estimator selects the most appropriate listing; then he must try to determine the job conditions this unit is based upon, and adjust the unit to fit the conditions of the job he is figuring. After becoming familiar with the tables he uses, the experienced estimator can make reasonably accurate interpolations to these units.

The better method, however, is to first analyze the particular conditions affecting the job in question; then a more exact labor unit can be derived on the basis of a cumulative evaluation

which reflects actual job conditions.

The "Point Evaluation" Table and the "Labor Unit Selection Chart" shown here provide the estimator with a quick and easy means of developing labor units which are tailor-made to fit the particular circumstances of any job. The ten parameters which are most significant in their effect on total fixture-installation time are listed in the Point Evaluation Table. Each item on the table has been weighted according to its influence. The Selection Chart features four curves representing the basic fixture types.

The method is simple. Merely select the listing on *every* line of the Evaluation Table which describes the job in question. Note the number of points



Three-lamp units—add 3 points and read on two-lamp unit curve. 6-ft units—deduct 3 points and read on 8-ft unit curve.

A new approach to the problem of obtaining labor units which accurately reflect actual conditions of any job. The pre-weighted Job Condition Evaluation Table and the Labor Unit Selection Chart offer a quick means of obtaining a precise estimate of installation costs.

under which this description falls. Having gone through *all ten lines*, add up the number of points; then refer to the Labor Unit Selection Chart to obtain the labor unit.

On the chart, the previously mentioned point total is first located on the scale at the left (ordinate). From there, read directly across to the curve describing the proper fixture; from this intersection the labor unit is read on the bottom (abscissa) scale.

Labor units for 3-lamp fixtures can be easily derived by adding three points to the total of job evaluation points and taking the reading on either the 2-lamp, 4-ft or 2-lamp, 8-ft unit curve. Similarly, 6-ft fixtures can be figured by deducting three points from the job

evaluation total and reading from the appropriate 8-ft unit curve.

Though the process of going through the Job Evaluation Table to derive a point total may appear unnecessarily time-consuming, a practical trial will reveal the speed and ease with which it can be done. Moreover use of the table insures proper consideration of frequently neglected, but costly job factors.

It is not necessary to develop a completely new set of job evaluation points for each type of fixture to be installed. On most projects a constant subtotal can be derived from the last four items on the table which will apply to all fixtures in the job. Moreover, where various sizes of the same basic lumi-

naires are used, one point total will apply in obtaining labor units from the Selection Chart with only the required adjustments for 3-lamp and 6-ft models.

The Job Condition Evaluation Table has been designed to cover all factors commonly affecting fixture installation time. For most projects, consideration of the listed parameters in the prescribed manner will obtain labor units accurately reflecting the nature of the job, but the estimator must be on the lookout for *unusual* conditions which may add substantially to the cost of installation. As they are encountered, the estimator can add them to his Evaluation Table for future reference.



ELECTRICAL CONTRACTORS IN CLASS at University of Wisconsin course in wiring and estimating. Two-day session occupied some 14 hours of lecture-demonstration and discussion of subjects fundamental to contractor operations.

Wisconsin's

Wiring and Estimating Institute

gives electrical contractors refresher course on technical and business fundamentals.



BE A STUDENT of the electrical code and know what it contains, George Andrae, Milwaukee electrical contractor and code expert, counsels class.

DESPITE snow, slick roads and sub-zero temperatures, 55 Wisconsin electrical contractors journeyed to the University of Wisconsin's Madison campus February 10 to attend a 2-day Electric Wiring and Estimating Institute. The sessions, arranged in cooperation with the Madison and Milwaukee Chapters, NECA, were part of a series of 24 Engineering Institutes covering a variety of subjects and being conducted by the University Extension Division and College of Engineering over a five-month period. This specific course was offered for the benefit of electrical contractors, architects, builders and others connected with the electrical construction industry.

Although the atmosphere in the electrical engineering building lecture



RUPERT FULLER, vocational school electrical instructor, Green Bay, Wis., warns contractors that Wisconsin law prescribes fines or imprisonment for violation of state electrical code.



FLOOR DISCUSSION was a natural byproduct of the sessions. Here, contractor Herman Welch of Waukesha, Wis., asks for clarification of a Wisconsin Electrical Code regulation. Answer had a definite bearing on future job estimates.

room was predominately academic, instruction was strictly on the practical side. Conference leaders were drawn from the electrical industry with a majority of the staff representing the contracting branch. Subject matter emphasis was placed on adequate wiring, estimating, electrical codes, installation methods, lighting techniques, new materials and equipment. Chalk and chart talks, slide presentations and demonstrations were used effectively during the lectures.

In return for their registration fee, living costs and two days away from their businesses, contractor conferees were given a comprehensive review of newest developments in their industry. A page-by-page interpretation of the new Handbook of Residential Wiring Design pointed up the features of wiring adequacy. Three hours review of the National and Wisconsin Electrical Codes generated considerable floor discussion and clarified numerous points which formerly had confused the contractors.

A slide tour of contractor mechanized field operations pointed up the economies resulting from use of power

WIRING AND ESTIMATING INSTITUTE STAFF

University of Wisconsin Personnel

Subject

Harold De Baun, C.P.A., Associate Professor of Commerce, University Extension Division

Bookkeeping

Paul J. Grogan, Director of Engineering Institutes
Robert A. Ratner, Ass't. Director of Engineering Institutes

Electrical Code

Ralph D. Smith, Coordinator, Engineering Institutes

Residential Wiring Standards

Electrical Industry Personnel

Electrical Code

Elmer Ahlvin, Lighting Advisor, Madison Gas & Electric Co., Madison, Wis.

Job Mechanization

George Andrae, President, Herman Andrae Electrical Company, Milwaukee, Wis.

Product Application

Ray Ashley, Consultant, Oak Park, Ill.

Electrical Code

August Eckel, Middle West Editor, Electrical Construction & Maintenance, Chicago, Ill.

Electrical Consumption Trends

David Evans, Evans-Reuschlein & Co. (contractors), Madison, Wis.

Lighting for Home, Industry and Commerce

Rupert Fuller, Instructor of Electricity, Vocational and Adult School, Green Bay, Wis.

Selling the Job

Harry Rellahan, Dealer Sales Promotion Manager, Wisconsin Power & Light Co., Madison, Wis.

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E. H. Schaefer, Lighting Engineer, Wisconsin Electric Power Co., Milwaukee, Wis.

George A. Sievers, Consulting Engineer, Milwaukee, Wis.



ESTIMATING AUTHORITY Ray Ashley, Oak Park, Ill., outlines accurate estimating procedures and allocation of direct job costs; tells class a clean, easy-to-understand estimate is a good sales tool.



SALES PSYCHOLOGY is as important in construction as in merchandising field, George A. Sievers, Milwaukee consulting engineer, tells contractors. Good appearance, sincerity, customer service and follow-through are important, he noted.



CONTRACTOR DAVE EVANS, Evans-Reuschlein & Co., Madison, demonstrates flexibility of modern electrical distribution equipment during his presentation of new production data.



PRESENTATION OF CERTIFICATES to course "students" is made by Robert A. Ratner, ass't. director, University of Wisconsin Engineering Institutes, at close of final session.

tools and job organization. Contributions of new equipment application to electrical system operation and maintenance efficiency were freely discussed.

Following a thorough review of the technical aspect of electrical contracting, the class learned about the vital importance of well-kept cost records, accurate estimating procedures and effective sales approaches. Experts outlined the basic fundamentals in each category. At the end of the session, the contractor "students" knew the fundamentals of bookkeeping: the mechanics of material take-off and listing; proper allocation of direct job costs and over-

head; the use of an estimate, where necessary, as a sales tool; and the application of tested sales psychology when talking to a customer.

Where can the contractors use what they learned at the Institute? In their everyday operation, of course; and, equally important, to capture their share of the tremendous market on the horizon. This, they were told at a dinner meeting, includes an electrical industry goal of 428 million home appliances to be sold in the next five years, plus a \$3½ billion home rewiring market, plus an annual \$100 million new home wiring potential. Details of electrical consumption trends in Wis-

consin give the contractors a benchmark for operation in their areas.

That the Institute was a success is beyond question. The undivided attention accorded conference leaders was evidence of the contractor interest in the course agenda. The quantity and quality of floor discussion during class periods was a most encouraging by-product of the subject presentations. Following adjournment, each "student" returned home with a folder full of notes, an Institute Certificate as visual evidence of his desire to improve his ability to serve his customers better, and a firm determination to apply the principles he learned.

SWITCHBOARD (rear view) is shown during modification. AC phase busses and neutral are indicated by arrows; upper dc busses are obstructed from view by neutral.



AN EXISTING dc switchboard at the Grand Central Palace, New York City office building, was recently modified during modernization of the building's electrical facilities to permit the board to feed both dc and ac loads.

The conversion, planned by E. A. Weekes, consulting engineer of New York City, was accomplished through the use of a multiple bus arrangement on the rear of the board.

Original design of the switchboard had provided all feeders with horizontally mounted 3-pole double-throw switches. This was to permit feeding

dc to the loads either from a top 3-wire bus, which carried current furnished by the New York Central Railroad, or from a bottom 3-wire bus, which was to have carried current furnished by Consolidated Edison. An additional 2-wire bus had been installed to provide dc standby current for elevator loads, also to be supplied by the utility. However, these standby services were never brought into the building, and the entire dc load remained on NYCRR service. Thus the lower 3-wire bus and the 2-wire bus, though installed, were never energized.

This excess copper and switchboard space were used to provide the necessary conversion for the introduction of ac. The unused lower 3-wire bus provided three phases of the ac feed, while a portion of the unused 2-wire bus was utilized as the neutral.

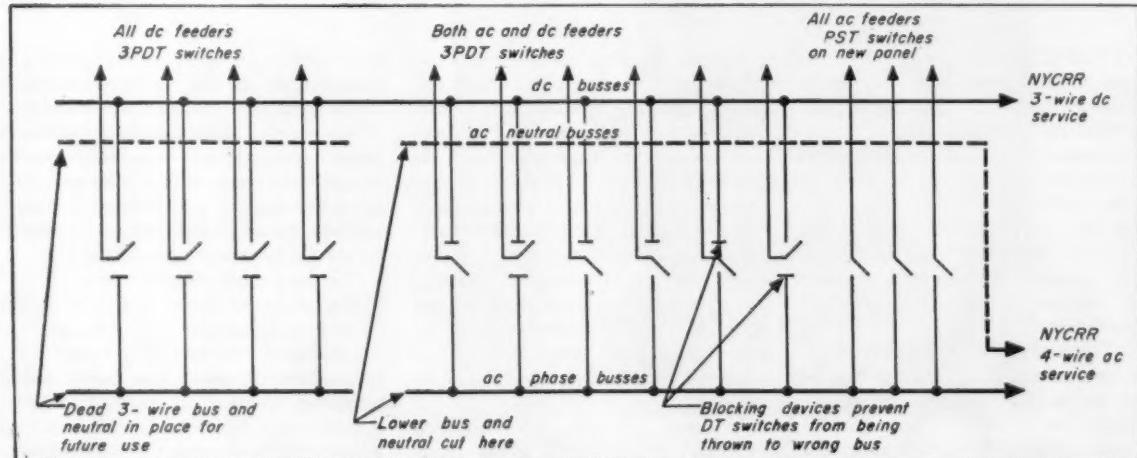
To permit individual metering of the ac circuits feeding loads of the principal tenant, these converted busses were dismounted from the board, cut in two, and reassembled. Only one of the resulting halves was energized, leaving the other half dead for future use should additional dc feeders be converted to ac.

Blocking devices on all double-throw switches prevent the switches from being thrown to the wrong bus. One new panel mounting all 3-pole single-throw switches was added to the switchboard. The upper 3-wire dc bus was not disturbed; it still furnishes current to remaining dc feeders.

All modifications were made by T. Frederick Jackson, Inc., New York City electrical contractors, without disrupting the existing service to the tenants.

AC and DC from Same Switchboard

Use of idle busses for ac service adds flexibility to old dc installation.



SIMPLIFIED SCHEMATIC shows switchboard multiple bus arrangement to provide both ac and dc service to feeders.



FIG. 1—TRANSFER TRUCK with roller-conveyor platform brings crated bus bars from loading dock to fabrication shop storage platform (12 ft by 20 ft) also built from sections of roller conveyor. Unit is 20 ft long and same height as platform.

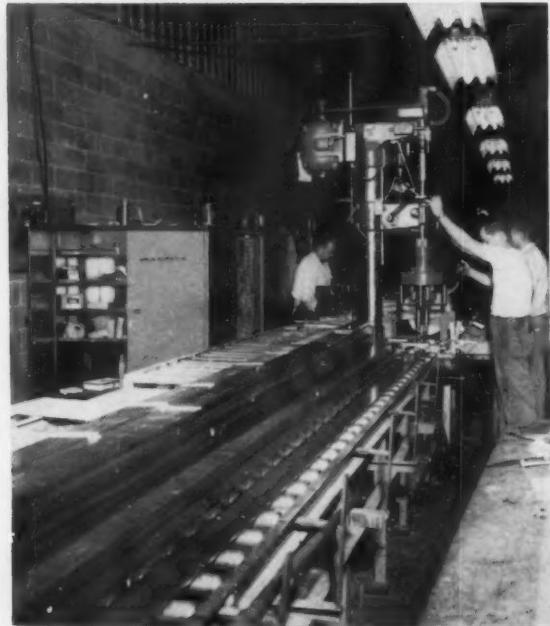


FIG. 2—PARALLEL CONVEYORS, each 42 ft long and 32 inches high, connect storage rack to fabrication and assembly line. Uncrated bus rests on 13-in. wide feeder conveyor; single bars ride 7-in. wide conveyor (front).

An Integrated **CONVEYORIZED FIELD-**

facilitated bus assembly and installation costs at Chevrolet's new spring and bumper plant in Livonia, Mich. Harlan Electric Co. adapted automotive in-line production methods.

INTEGRATION of roller-conveyors and in-line fabricating stations by Harlan Electric Company, project electrical contractor, made plating bus installation simple and more efficient at Chevrolet's new Spring and Bumper Division plant in Livonia, Mich.

Of the entire plant electrical installation, the electroplating system alone involved the handling, fabrication, assembly and mounting of some 580,000 pounds of $\frac{1}{4}$ -in. by 4-in. copper bar. Thousands of bus sections, offsets and connections were required to connect 54 plating generators (15,000-ampere, 9 to 15 volts) to three parallel automatic plating lines, each about 500 feet long, reportedly the largest plating "room" in industry.

Harlan field engineers viewed this job as a distinct challenge to their collective ingenuity and met it by establishing one of the most highly mechanized field-fabrication shops seen in the electrical construction field. When they were finished, they had a small-scale, mass-production operation incorporating many fatigue-reduction features found in the automotive industry. Crated copper bus came in at one end of the shop, passed through fabricating lines and emerged at the other end as a completed assembly ready for installation.

As seen in the accompanying sequence photographs, power tools were used extensively for fabricating operations. In-line and adjacent work

stations were fed by a system of parallel roller-conveyors at a comfortable 32-in. working height to speed transfer of bus sections from one station to another. Actually, bus bars rode conveyors from the time they were picked up at the loading platform until they reached the assembly benches at the end of the fabrication lines.

The field shop consisted of a wire-screen enclosure, about 25 ft wide and 80 ft long, along one wall of the plating building. At the "raw material" end, crates of copper bus bar (each weighing about 670 pounds) were towed in on a 20-ft long transfer truck whose bed was made of roller-conveyor sections. The crated bus was rolled off the truck onto a storage

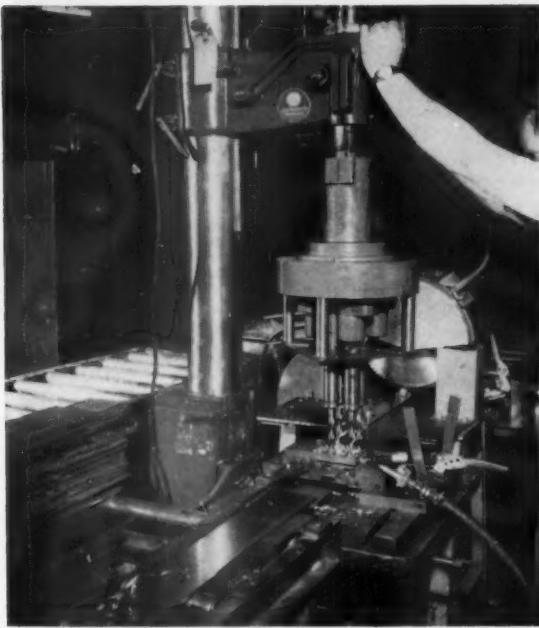


FIG. 3—MULTIPLE-HEAD DRILL press is first in-line fabrication station. Here, four 9/16-in. holes are drilled in bus end in one operation. Lever clamp holds bus in jig. Air hose and nozzle in foreground keep press bed free of copper chips.

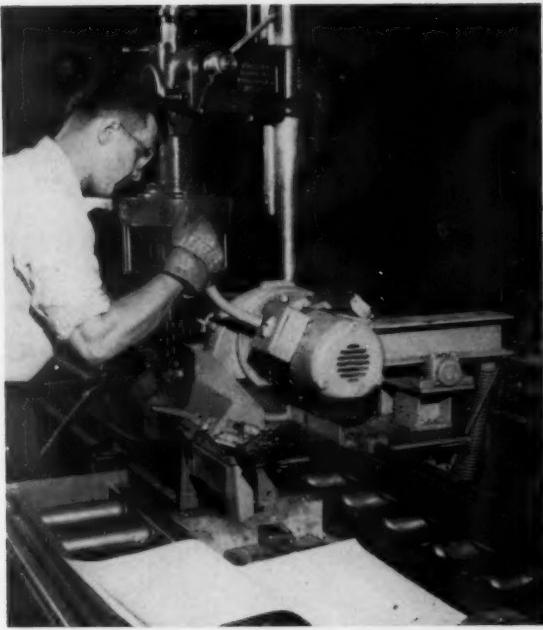


FIG. 4—CIRCULAR SAW with 75-tooth, 12-in. diameter blade cuts bus to desired length in a few seconds after bar is rolled down conveyor to pre-set stop block. Bar is then brought back a few inches to drill press where four holes are drilled.

FABRICATION SHOP

By H. O. Krippendorff

Vice President
Harlan Electric Company
Detroit, Mich.

platform (12-ft by 20-ft) made of roller conveyor sections supported at 32-in. height. Stacks of uncrated bars were stored on a 13-in. wide conveyor extension ending at the first work station some 22 ft down the fabrication line. The rest of the fabrication line extended beyond this point with interconnecting conveyors paralleling the building line about 12 ft out from the wall.

Single bus bars rode a 7-in. wide conveyor (immediately in front of the storage line) to the first work station which combined a drilling and cutting operation. First, a multiple-head drill press drilled four holes in the end of the bar. The bar was then rolled on to a conveyor stop block and cut to size



FIG. 5—BELT SANDERS clean and polish bus contact areas prior to silver plating. Conveyor tables, with plywood bases at sanding stations, are on opposite side of fabrication aisle to keep metallic dust from silver plating area.

by a circular saw. The cut end was backed up to the drill press where four bolt holes were drilled in the new end in one operation. Cut and drilled bus sections were then transferred across the aisle to a sanding table where contact areas were cleaned with a conventional power belt sander. Sanded bars then were transferred across the fabrication line conveyor to the silver plating stations where mechanics used brush plating units to apply a silver coating to contact areas. Coated bars then went down a conveyor to a power bender where required offsets were made in individual bus sections. From this point, fabricated bars rode a conveyor extension to the assembly benches where parallel bar assemblies were made up prior to installation.

Normally, an 11-man working crew operated the fabrication line. Two mechanics were on the drilling and cutting station; one on sanding; two at the plating stations; two on bending; and four mechanics at the assembly benches. A second fabrication line with drilling, cutting and bending stations was maintained to keep pace with installation crews during peak periods.

Both contractor and owner were well pleased with the advantages afforded by the integrated fabrication line. Substitution of conveyors and horsepower for muscle power reduced material handling and mechanic fatigue to such an extent that over-all fabrication and installation efficiencies were surprisingly high.



MEN RESPONSIBLE for organization and operation of field fabrication shop were (L to R): Robert Pappert, bus fabrication foreman and John Pope, project superintendent for Harlan Electric Company.



FIG. 6—SILVER PLATING of contact areas is done with portable brush-plating unit at two stations connected by conveyor line. Pure silver anode in cloth glove is dipped in silver nitrate solution, then brushed across bus to leave silver deposit. Mobile frame supports plating equipment.



FIG. 7—POWER BENDER is last fabrication station at end of 20-ft. conveyor in front of plating station. Standard hand bender, equipped with motor-operated hydraulic system, makes offsets in bus bar. Conveyor has stop block and measuring tape to make bends within dimensional limits.



FIG. 8—ASSEMBLY BENCHES at end of fabrication line are fed by conveyor extension to bender line. Here, mechanics align eight $\frac{1}{4}$ -in. by 4-in. bars in double-offset assembly.

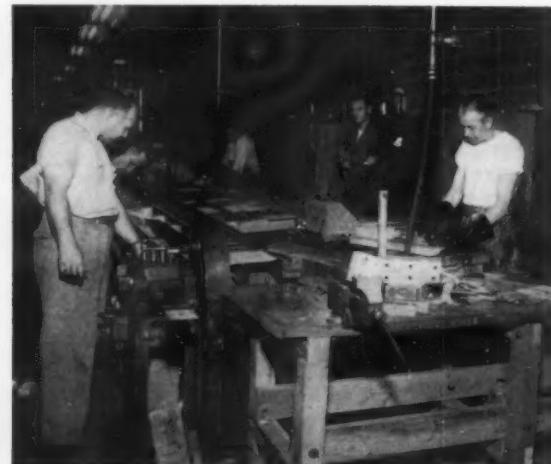
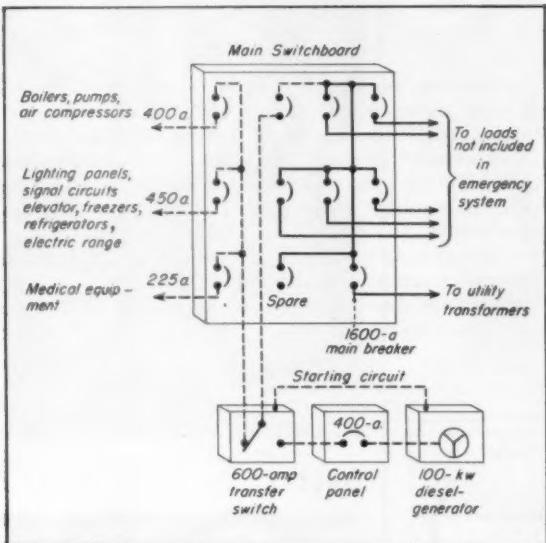


FIG. 9—END OF FABRICATION line showing three parallel conveyors: one feeding bender (left); one leading from cutting and drilling station; and one for plating stations (right).



STANDBY POWER provisions are shown by schematic single-line diagram. Broken lines designate wiring associated with emergency system.



DIESEL-GENERATOR furnishes 100 kw of 3-phase ac power at 120/208 volts. Generator is rated at 347.5 amps, 1200 rpm.

DIESEL-GENERATOR SET PROVIDES

100 Kw of Standby Power

FOR HOSPITAL EMERGENCY USE

A 100-kw diesel-generator set is used to provide automatic standby power at St. Clare's Hospital, Denville, N. J.

Lighting and power circuits were planned to permit all hospital functions to continue on a limited scale on standby power should utility power fail. All emergency loads are connected to three breakers on the main switchboard: (1) A 450-amp breaker feeds an emergency distribution panel servicing all emergency lighting panels, kitchen freezers, refrigerators and an electric range, an elevator, and all signal, alarm and communications systems. (2) A 400-amp breaker feeds boilers, pumps and air compressors through a boiler room power panel. (3) A 225-amp breaker feeds an x-ray panel servicing electrically operated medical equipment.

To aid identification of lighting circuits which are part of the emergency system, each regular lighting cabinet is accompanied by a smaller cabinet containing only breakers for emergency circuits. This avoids confusion and unnecessary random operation of break-

ers to locate active circuits during an emergency.

Normally connected through a 600-amp Asco automatic transfer switch, these three breakers may be fed in an emergency by the diesel-generator through operation of the transfer switch.

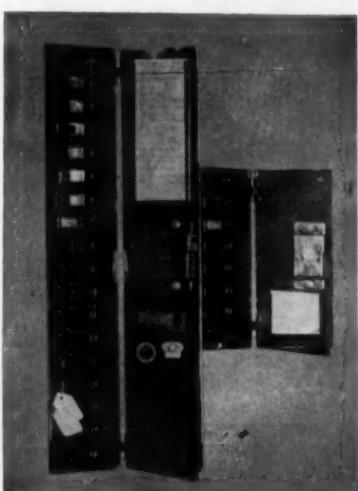
The relay which controls the transfer switch opens normal contacts and closes emergency contacts when the line voltage falls below 70% of normal. This operation starts up the diesel unit through a cranking relay on the diesel control panel and a battery-operated starting motor.

The normal contacts are automatically remade when utility service is restored. Should the utility power and the diesel unit both fail, the emergency feeders would be connected automatically to the first source restored. One or the other power source is always connected to the emergency load; there is no neutral position of the switch.

The 100-kw G-E generator has a static-type built-in voltage regulator and direct-connected exciter. Emer-

gency power plant, control panel, and transfer switch are all mounted in room with main switchboard.

Installation was by Edward J. White Co. of Newark, N. J.

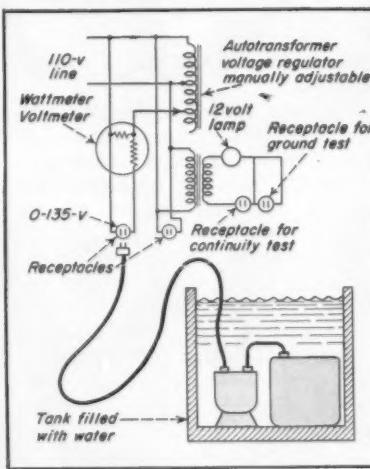
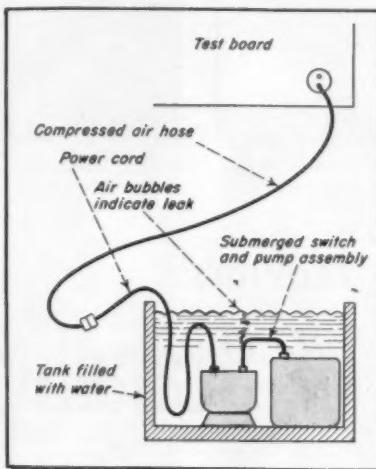


AUXILIARY LIGHTING PANEL (right) contains only those circuits which may be energized by emergency power unit.

AT THE TEST BENCH-11

TESTING SUMP PUMPS

By Walter J. Prise, Chief Engineer
Queens Electric Motors, Inc., Jamaica, N. Y.



TEST 2.

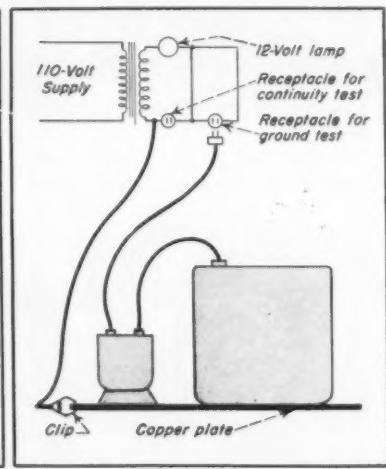
Testing switch for operation on 85 volts and testing for ground. Due to voltage drop in the line feeding the sump pump, it is very often required to start and operate on low voltage. In this test, the switch is tested for operation on 85 volts, allowing voltage to come down to the minimum value specified by the manufacturer for operation of the pump. Voltage adjustment is made by means of a voltage regulator (auto-transformer) which is built into the test board. A diagram of the test board is shown in sketch, left. The board allows tests at various voltages; safe low voltage for ground testing is supplied through transformer. This low

After repairs, all sump pumps should be put through a rigid testing procedure. Such testing is necessary to assure trouble-free operation of pumps after installation. And inasmuch as some sump pumps are required by their very nature to operate under water, tests must be arranged so that operation under water can also be checked and guaranteed.

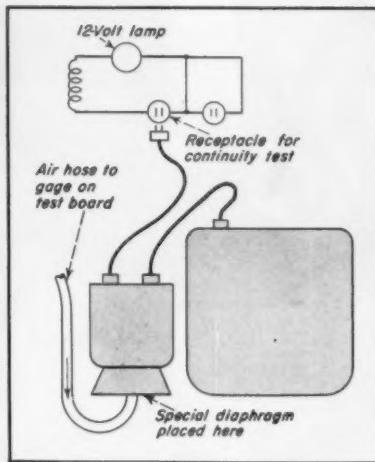
The following tests provide a rigorous, overall examination which can be applied to any sump pump. Satisfactory results from these tests indicate that a pump is in proper and sound operating condition and ready for installation.

TEST 1.

Testing the condition of the power cord. In this test, the sump pump is submerged in a tank of water and its electric power cord (arrow in photo) is kept under water for as much of its length as possible, just enough of the cord coming out of the tank to reach the test board and connect to a thin air hose. The air hose has a cord receptacle on its end to accept the plug on the power cord. By pumping air through the power cord, any leaks in the cord jacket, at the connection to the pump or in the switch or pump itself will be revealed by air bubbles coming from the tank in which the pump is submerged. All such leaks must be traced and eliminated to prevent shorts in the cord, switch or pump.

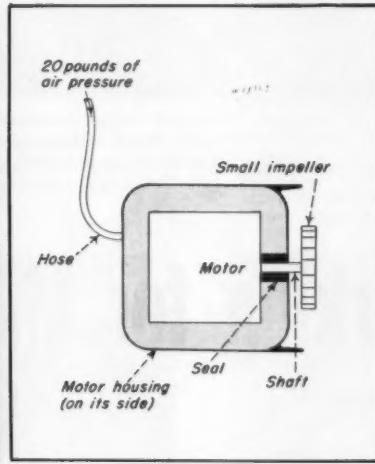


voltage is used to test pump for existence of ground between power cord and housing of pump or switch. As shown in sketch, right, the sump pump and switch assembly is placed on a copper plate on the test bench. A wire is connected between the plate and one side of the low voltage transformer, effectively connecting the housings of the pump assembly to this side of the transformer. The plug from the pump is then put in the receptacle for ground test. If either of the power cord conductors is at any point in contact with (grounded to) the housings, a circuit is completed and the 12-volt lamp will light on the test board.



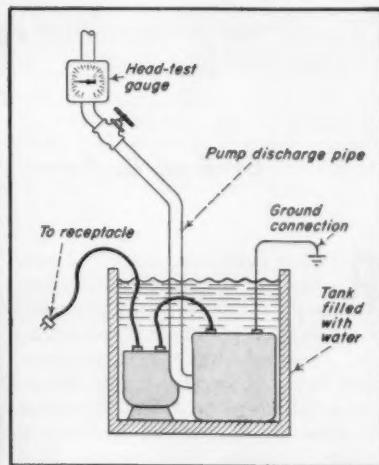
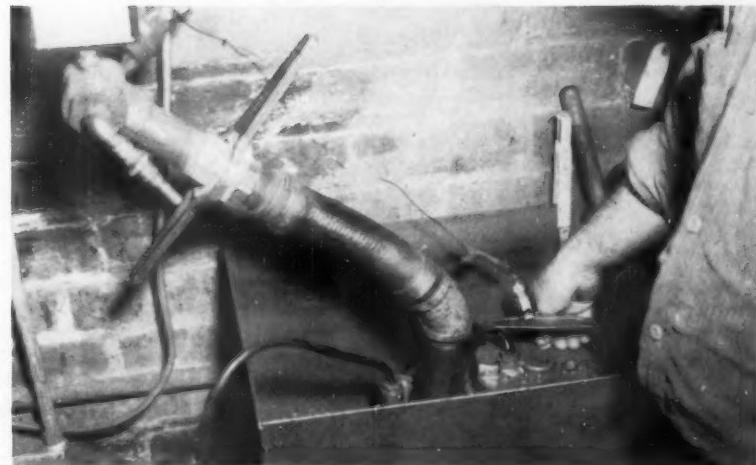
TEST 3.

Testing the switch for operating pressure. A special diaphragm connected by a flexible hose to a pressure gage on the board is placed under the switch. When the pressure reaches a certain limit—as shown in the photo it is 12 inches of water column on the board—the switch will close and thus complete a circuit which lights the 12-volt lamp on the test board. In this test, the power cord from the pump is plugged into the receptacle used to test for continuity.



TEST 4.

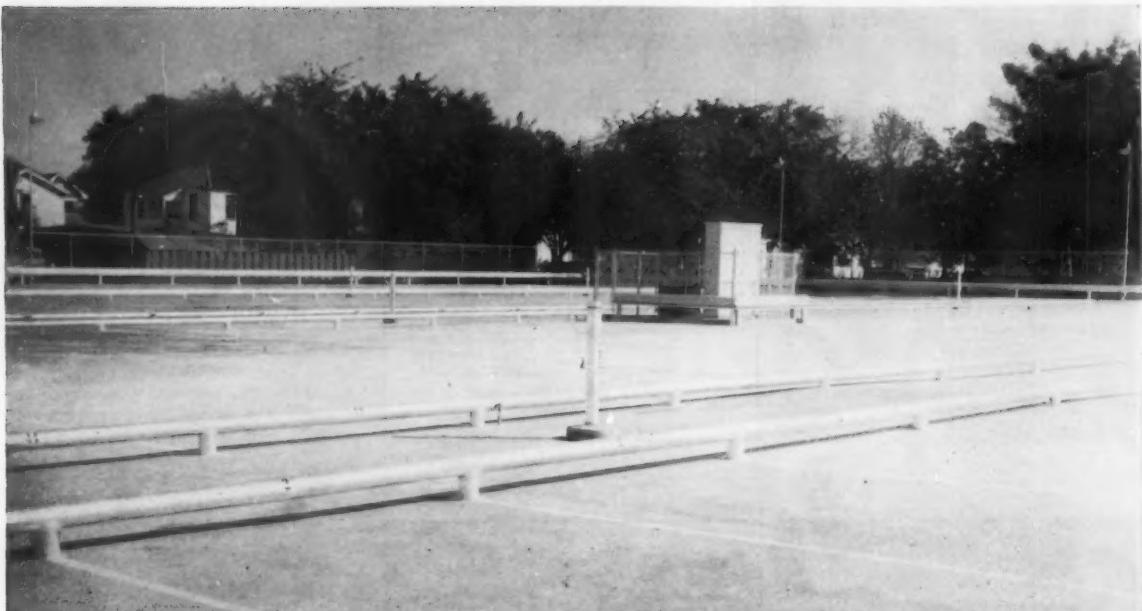
Testing for leaks around the shaft seal between motor housing and compartment where impeller is located. In this test a special impeller of small size is used. Air is introduced into the motor chamber; escaping bubbles of air will indicate poor seal when pump is submerged in water tank. Photo shows unit being readied for immersion in the water tank. Small impeller and the compartment in bottom of housing are shown. The small impeller is used to allow a better look at the seal when the assembly is under water. If the regular impeller were used it would completely obscure view of the seal.



TEST 5.

Testing for overall operation. The assembled pump is submerged in a tank of water and its water discharge tube is connected to a head-test setup. When the power cord is connected to the electrical receptacle (first provide a ground

connection to the pump housing), the unit should pump water up 10 feet. Failure to obtain a reading of 10 feet on the head-test gage indicates unsatisfactory condition of the pump, requiring overall recheck of the unit.



PARKING LOT consists of large area concrete slab with heavy-pipe welded bumper fences set in concrete. Trucks will occupy individual spaces indicated by white lines on concrete, with front wheels resting against bumper fences. Vertical post between bumper fences in foreground is one of many such stations from which air and water are available for trucks.

Power Parking for Milk Trucks

How an outdoor parking lot at the Carnation Milk Company's Houston, Texas, plant was wired to provide light for parking and power for refrigerating equipment in parked trucks.

By Fred C. Peters, *Engineer, Gulf Electric Company, Houston, Texas*

PART of overall expansion and modernization of Carnation Milk Company's Houston, Texas, plant was electrification of an outdoor parking lot. Designed especially to accommodate large refrigerated trucks, this lot sets a pattern which will be followed in construction of parking facilities at other Carnation Milk plants. Both light and power are provided by the electrical system in this lot.

The lot consists of a large rectangular concrete slab with a cyclone fence along three sides. The open side is toward the street from which trucks

will enter the lot. Also on the street side of the lot, a repair and service garage will be constructed. Individual truck parking positions are indicated on the lot by long runs of heavy pipe bumpers and white stripes on the concrete, as shown in photos.

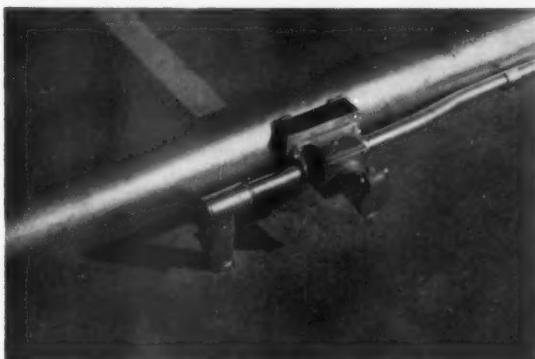
Electrification of the lot begins near the street edge of the lot, alongside the space to be occupied by the new garage building. A temporary service is set up here to supply the lot. From this point, four No. 500 MCM conductors in 4½-in. conduit are carried underground to a power and light distribution cabi-

net in the middle of the lot. The underground conduit run turns up into the weatherproof enclosure which is surrounded by a cyclone fence and protected against the trucks by sturdy steel bumpers. When the new garage building is built, the temporary service will be discontinued, and power will be carried underground from the new building and tied into the present feeder run at the temporary service location.

Power to the distribution cabinet in the lot is 220 volts, 3-phase, 4-wire, from a delta-connected source, with a grounded neutral center tapped from



WEATHERPROOF RECEPTACLES are mounted along pipe bumper, opposite side against which truck wheels rest. Fred Peters is shown here lifting cover on typical receptacle, to which power cord from truck's compressor can be easily connected.

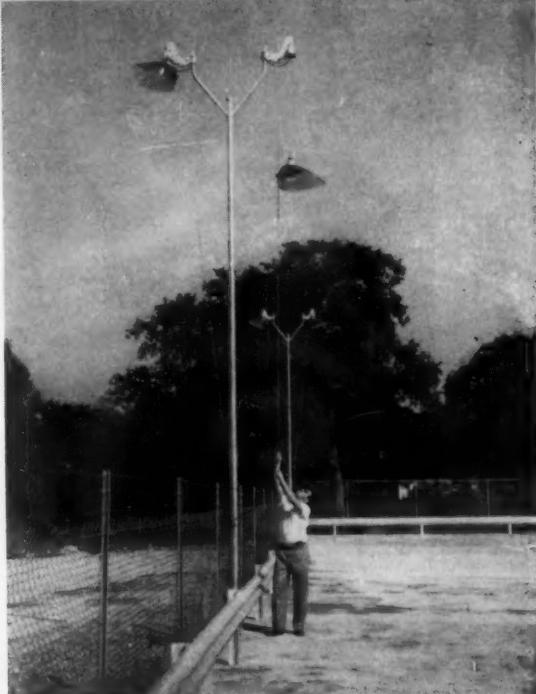


MOUNTING DETAIL of typical receptacle shows conduit fitting on stubbed up underground conduit from distribution cabinet. Conduit feeds receptacle shown here and one other receptacle of the same type. Box is mounted on a wide piece of "U" channel welded to the pipe bumper.

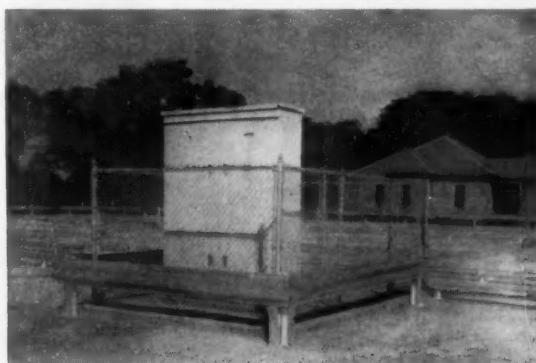
one phase. The cabinet houses circuit breaker panelboards for power and light. The power panel contains 30-amp CB's for circuits to weatherproof receptacles along the pipe bumpers at parking positions. Each circuit consists of three No. 6's and a No. 8 ground and neutral, all TW conductors, in 1-in. conduit run from the distribution cabinet down under the parking lot and up to receptacles. There are two receptacles on each circuit, and each receptacle is a 30-amp, 4-pole 220-volt weatherproof unit from which single or three-phase power may

be taken. From the distribution cabinet, conduit runs fan out to pairs of receptacles throughout the area.

Floodlighting for the large lot is also controlled from the distribution cabinet. A photoelectric-controlled contactor is mounted in the cabinet and provides switching of all of the floodlights to have them "ON" during hours of darkness and "OFF" during daylight hours. There are three double-light standards and five single light standards spaced around the perimeter of the parking lot. Each standard is fed by underground conduit, with two



FLOODLIGHTING STANDARDS are spaced around the parking area. Both double-light standards (shown here) and single-light standards are used. Individual luminaires may be disconnected from their locked-in position and lowered to the ground by a chain and pulley arrangement as shown.



DISTRIBUTION CABINET is set in middle of the lot; is supplied by underground feeder from a corner of the lot; is point from which underground power and lighting circuits fan out to receptacles and floodlighting standards. Heavy steel bumpers protect area from bumping by trucks.

No. 12 wires for each of the 110-volt floodlamp units. Each lamp circuit is protected by a 20-amp CB in cabinet.

Each floodlight unit consists of a large porcelain enamel diffusing reflector with a beam-producing, processed aluminum inner floodlighting projector and a 1500-watt incandescent lamp. Each unit is suspended from a "Saflox" floodlight lowering attachment, a chain and pulley arrangement which provides ready raising or lowering of the fixture from the ground. Hanger has a locked-in position for the fixture at the top of the standard.



LIGHT and

By Frank G. Camus,
President, C & C Electric Co., Inc.,
Shreveport, La.

ROBUST, extensive electrical application today complements the modern architectural simplicity and clean-line interior layout of St. Catherines Church, Shreveport, La. Here, complete air conditioning and many and varied lighting techniques are supplied by a modern electrical wiring system. A close look at the overall installation points up its thoroughness.

Electric power is delivered to the church by two separate services. Both drop to the building from utility pole lines near one side. The lighting service is 120/240 volts, single-phase, 3-wire, and consists of three 350MCM conductors in 3-in. conduit. The power service is 220 volts, three-phase, three-wire and also consists of three 350MCM conductors in 3-in. conduit. In both cases, the conduit comes down the side of the building to a metering box. This arrangement is shown in 1.

Main disconnects for the two services are shown in 2 and 3, in an equipment room in the rear corner of the building. The three switches shown in 2 are supplied by conductors spliced to the SE conductors in the junction box shown below the two larger switches. The SE conductors come into the building through the wall, from the meter box outside to the j. b. in the equipment room. The largest switch (left) is a 200-amp, 3-wire, solid neutral unit, fused at 175 amps and feeding a single-phase, 3-wire branch circuit panelboard in the rectory by three No. 4/0 conductors in 2½-in. conduit. The switch at the right is a 100-amp, 3-wire, solid neutral unit, fused at 100 amps and feeding a branch circuit panelboard in a room off to the right side of the main altar. Three No. 1 conductors in 1½-in. conduit feed this panel. The small switch shown is a 3-wire, SN, 30-amp emergency service switch fused at 15 amps. This switch feeds three No. 12 conductors in ¼-in. conduit for emergency lighting circuits around the inside of the church.

A fused power distribution panel is shown in 3. This 3-phase, 3-wire, 220-

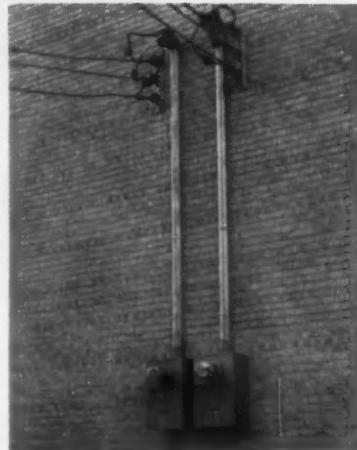


FIG. 1—Dual service from utility pole line to side of church building consists of 120/240-volt, single-phase, 3-wire lighting service at left and 220-volt, 3-phase, 3-wire power service at right.

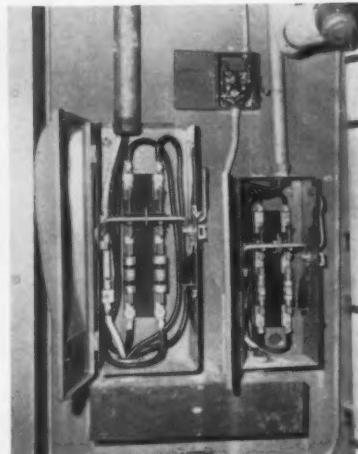


FIG. 2—Lighting service main disconnect is provided by three 3-wire SN fused switches which tie into the service conductors in the junction box shown below the two larger switches.

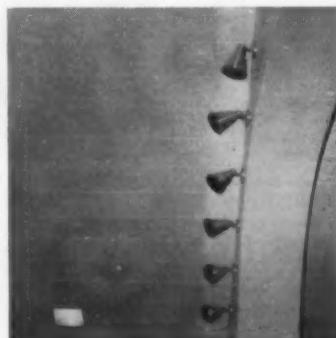


FIG. 6—Floodlamp fixtures are mounted on the altar side of the main arch; incandescent boxes are recessed in ceiling.

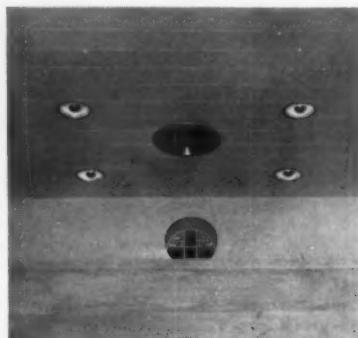


FIG. 7—Indirect, incandescent lighting units are recessed in the ceiling above the choir loft.

volt panel is wall-mounted alongside the lighting service switches and is fed through the wall from the power service metering box on the outside wall. The main switch in the panel is the bottom unit, rated and fused at 400 amps. Another 400-amp switch above the main switch is fused at 250 amps and feeds a 30-hp air condition-

ing compressor in the same room, over three No. 1 conductors in 1½-in. conduit. Other switches in the panel include: 200-amp unit fused at 125 amps supplying three No. 6's in 1-in. conduit to pump, circulator and air conditioning-unit motors in the rectory; two 100-amp switches fused at 70 amps each, four 30-amp switches and

POWER in a Modern Church

Separate power and light services, 63-hp of accumulated motor load and modern lighting applications highlight the extensive electrical system in St. Catherines Church in suburban Shreveport, La.



FIG. 3—Power distribution panel is fed through wall from outside; contains power service main disconnect; is mounted alongside lighting service disconnect switches in equipment room.

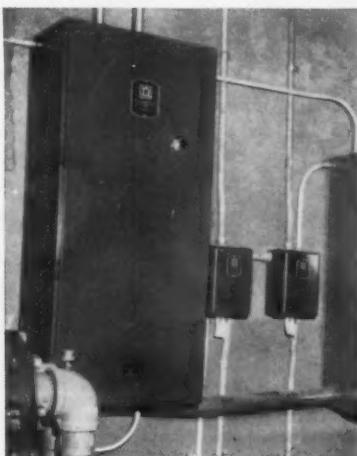


FIG. 4—Motor controllers are wall-mounted in church electrical equipment room.



FIG. 5—Various lighting units and techniques are used in the main body of the church.

two 60-amp switches—all feeding fan, pump and air conditioning motors.

The motor load served from the power panel totals over 63-hp. A 220-volt, 3-pole, reduced voltage, auto-transformer type magnetic starter for the 30-hp motor is shown in the church equipment room at the left in 4.

Arrangement of lighting equipment in the 85-ft by 45-ft main body of the church is shown in 5. Recessed in the ceiling along the centerline of each bank of pews, silver-bowl lamp fixtures with large, flat, circular diffusing glass shields are mounted 20 feet apart, four units between the front and rear of the church on each side of the main aisle. Each unit is equipped with a center-mounted, 300-watt lamp which utilizes the fixture reflector to direct lumen output down to the pews.

Supplementing the light output of the round, silver-bowl lamp units, 40 round recessed incandescent hi-hat units are mounted on balanced centers in the acoustical ceiling. Each of these units lighting the main body of the church has a 150-watt PAR-38 flood-lamp and a 2-in. aperture. Each of the small altars off to the side of the main

altar is lighted by two round, recessed incandescent fixtures with a 150-watt R-40 spot lamp in each.

Along each side of the main body of the church, fluorescent cove lighting adds to the lighting intensity and provides decorative relief from the incandescent down lighting. As shown in 5, the cove along each side is about 2 feet down from the ceiling. Each of the coves contains eight 8-ft slimline fixtures (two 96-in. T-12, 75-watt lamps in each), mounted end to end in the cove.

Lighting for the main altar consists of floodlamp and recessed incandescent units. Immediately behind the top part of the arch which separates the sanctuary from the main body of the church, nine 150-watt PAR-38 flood-lamps, each in its own conical metal housing with swivel mount, are mounted close to the ceiling. (See 6) These units are aimed to properly and effectively illuminate the main altar and to provide lighting accents where required. In the sanctuary ceiling, four 200-watt recessed, lensed incandescent boxes are mounted on balanced spacings to provide general lighting.

Still another lighting application is that in the choir loft, shown in 7. Eight recessed, indirect bowl-type fixtures are mounted in the ceiling above the choir. Each fixture consists of a bowl-shaped recessed reflector containing a 100-watt lamp in its center, with a cup reflector suspended below the lamp bowl.

A high quality public address system is installed in the church. The amplifier is located behind the side of the sanctuary arch. Eight loudspeakers for this system are concealed with baffle assemblies behind false ceiling tiles above the main body of the church. These speakers are spaced throughout the ceiling to provide widespread dispersion of sound.

Similar fullness of electrical application is also found in the rectory of the church. Here, in addition to complete air conditioning and extensive modern lighting applications, 110-volt electric panel heaters are installed in the various rooms.

Louis E. Moossy, Shreveport, La., was the architect of this church. Hadra and Malahy were the electrical engineers.



OLD STORE sales area with high metal-covered ceiling and exposed air ducts was illuminated to approximately 30 footcandles by chain-suspended, glass-enclosed, incandescent fixtures.

DEPARTMENT STORE RELIGHTING

with trans-lighted ceiling solved structural problems and created interesting luminous-bay effect. Vari-Spaced system installed by MacLagan Electric Co., Chicago.

By George Ross, Sylvania Electric Products Inc., Melrose Park, Ill.

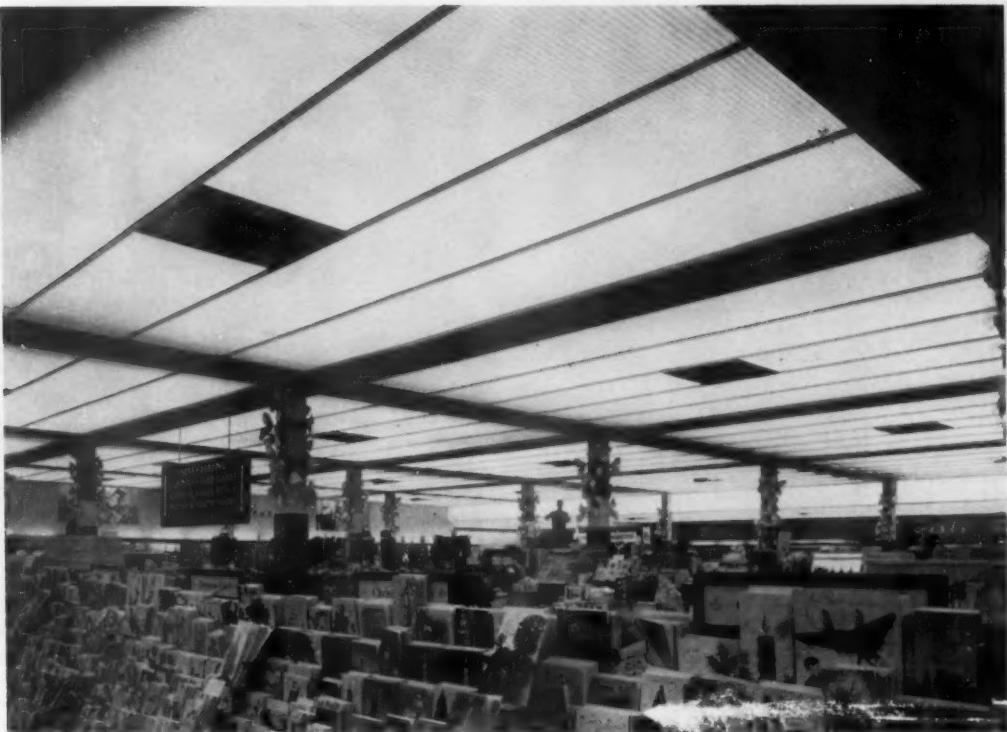
AN INTERESTING new concept of illuminated ceiling lighting was attained when the Klaus Department Store in Chicago converted two stores into one and relighted the combined 9,500-sq ft sales area with fluorescent units. Owner John Klaus wanted to get the same 50-footcandle level in the new area that he maintained in a third section of his building illuminated by 2-light, 100-watt troffers. Structural conditions, presence of ventilating ducts and difference in ceiling heights precluded an extension of the troffer system in the new area. Mounting fixtures on existing ducts

and a 3-ft wide beam separating the two stores would have destroyed illumination uniformity and produced objectionable bright streaks.

Choice of suspended luminous ceiling area lighting (Sylvania Sylvan-Aire), installed by MacLagan Electric Company, circumvented most of these structural problems. One or two remained requiring a compromise on the part of all parties concerned. The cavity space, with its air ducts, above the new suspended ceiling did not permit proper lamp spacing for the desired footcandle level. Since there is a direct ratio of lamp spacing to cavity

depth for uniformity, it was not practical to space lamps closer together. To do so would have resulted in a higher intensity than that wanted by the owner to match his other lighting.

A conference between owner, ventilating engineer and lighting engineer led to a design which incorporated panels of acoustic material mounted in the suspended ceiling under beam lines between columns, and around the columns. Ventilating anemostats were located in the center of each illuminated area. This created a pleasant luminous-bay effect which provides the desired lighting intensity and breaks



REMODELED AREA with its illuminated suspended ceiling has 50 footcandles of comfortable, glare-free lighting. Note pleasant bay-effect created by lines of acoustic material panels connecting columns.

up the general monotony of vast area illumination with the contrasting lines of acoustic material. In general, the longitudinal and transverse acoustic panels were set on specially cut support channels under the ventilating ducts and dropped beams where the cavity space was too shallow to permit fixture installation.

In one area at the rear of the remodeled store, excessively deep ventilating ducts required two different ceiling heights. Installation of a vertical curtain wall of plastic at this point blended together the two illuminated ceilings.

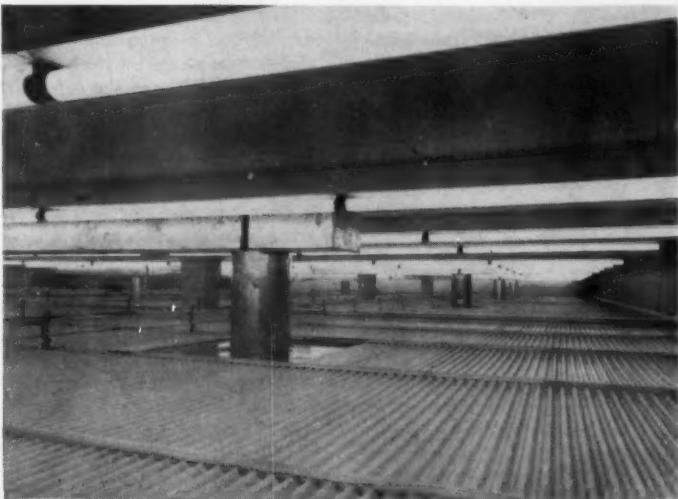
Lighting is provided by continuous rows of 40-watt rapid-start, single-lamp fluorescent strips spaced on 37-in. centers. The Sylvan-Aire ceiling is suspended 11-ft, 6-in. above floor level to match the troffer installation in the original store area. The use of V-shaped "Sono-Wedges" lined with thick glass-fiber pads, deadens noise and reduces distracting sound to comfortable levels.

Because of the structural problems encountered, the Klaus installation is of the Vari-Spaced type. The spacer bars of this particular system provide variable spacing features and permit attainment of any intensity level with a variety of lamp spacing. A similar

Uni-Spaced system is generally used where fixtures can be installed on 3-ft. centers to conform to the exact location of the plastic support channels.

Mr. Klaus now has an easy-to-maintain lighting system which gives him a maintained intensity of 50 footcandles of comfortable, glare-free illumination and a ceiling which complements the

interior decor. Customer traffic continued at an almost normal pace during relighting and he is confident sales are bound to increase as a result of his better-lighted, remodeled store. Chances that this lighting system will become "dated" are quite remote and a change in either ceiling pattern or intensity can be made inexpensively.



CAVITY SPACE above plastic ceiling shows suspension method using adjustable bar-support clamps. Continuous-row, single-lamp fluorescent channels are on 37-in. centers for this Vari-Spaced installation. Ducts with cylindrical drops feed Anemostats at center of each bay.



RENOVATED MAIN FLOOR features perimeter lighting, sleek modern showcases with built-in fluorescent strips. New surface-mounted ceiling units composed of four 200-watt lamps with individual reflectors and Holophane lenses are located at the center of each 20 by 20-ft bay.

DEPARTMENT STORE ADOPTS . . .

Three-Stage Modernization Plan

DOWN time is a prime consideration in the electrical modernization of commercial premises. Work must be carefully scheduled to minimize the store's loss of selling time.

This problem was highlighted when Ohrbach's department store took over a 50-year-old 10-story building in New York's midtown shopping district. Despite the need for extensive electrical renovations, it was mandatory that the doors be opened in time for the lucrative Christmas shopping season.

Preliminary surveys by consulting engineers Smith and Silverman had revealed that the existing lighting, the distribution and the dc service were totally inadequate to serve present-day merchandising techniques. Moreover, facilities had to be provided for powering a central air conditioning system. Since the occupants intended to make many structural changes as well, it was apparent that the entire

electrical job could not be completed in time to meet the deadline.

The problem, then, was to devise a modernization program whereby the store could present a fresh "new" look on opening day and the deferred parts of the project could be completed later without closing the store.

Plan Development

Obtaining the new look in the sales areas dictated the inclusion of several items in the initial, pre-opening-day phase of the job:

1. Stepping up the level of the general lighting.
2. New installations for certain specialty shops and service departments.
3. Display lighting for built-in wall cases and clothing racks.
4. Perimeter lighting around the walls of each sales floor.

From there, it followed that the new ac service and distribution would have to be installed immediately to carry this additional load. Rewiring of

branch circuits was also included in Stage I since this work could be most efficiently handled while new panels were being mounted. The time schedule was not affected because the rewiring could be done by separate teams.

Stage II of the operation, now under way, consists of wiring for executive offices and power and control connections for the new air conditioning system. This work could not be accomplished in time for the opening along with the preceding items, so it was deferred since the equipment is located in the sub-basement and hidden service areas. Completion is scheduled for early summer.

The final stage of the program will be comprised of renovation of the four storage floors and of the installation of ultra-modern lighting in all sales departments.

Service and Distribution

Utility company power enters the building from under-sidewalk vaults at



MULTIPLE FLUORESCENT STRIPS inside clothing racks and wall cases focus shopper's attention on merchandise. Existing ceiling pendants on upper floors were modified for 500-watt lamps and new glassware. Troffers at right illuminate the escalator island and risers.

New ac distribution system and stepped-up lighting for 50-year-old commercial building in time for the Christmas rush was Stage I. Plan permits economical future installation of air conditioning and ultra-modern lighting without closing down store operation.

the northeast and northwest corners of the basement in order to minimize voltage drop in the inside distribution system.

The easterly service equipment consists of two 5000-amp, 3-phase pressure type main switches, each fed from separate Y-connected transformer banks. Main switchboards "A" and "B", which are served by these switches, each consist of nine 600-amp "L" frame circuit breakers with relays rated to the size of the individual loads. Provision is made on each of these boards for the future addition of a 1600-amp pressure switch and two 600-amp breakers to serve air conditioning equipment when it is installed.

The westerly service is handled by Switchboard "C" through a similar switch of 4000-amp capacity. This board is made up of 12 600-amp breakers of which three are spares.

Feeder conduits from these three boards are concentrated at four riser points, with pull boxes and cable sup-

ports for each riser on the second, fifth and eighth floors. Four-wire feeders of 500MCM Type RH-RW cable supply energy to two, three or four lighting panels according to load and voltage drop considerations. Both light and power feeders were designed to carry the maximum capacity of the panels which they serve.

Sufficient circuit capacity to serve anticipated lighting load is provided from the three 42-circuit and one 32-circuit lighting panels installed on each floor. Each of these 3-phase, 4-wire panels consists of 15-amp single-pole circuit breakers with a 225-amp main breaker.

To avoid rerouting branch circuit home runs, the new lighting panels were mounted overlapping the old flush panels; after the interiors of the old panels were removed, new circuit wiring was pulled through the existing panel boxes into the new panels and connected. The old 3-wire dc lighting feeders were abandoned but the con-

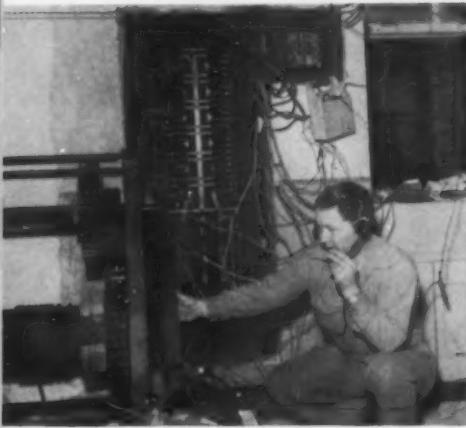
duits were left in place to afford spare raceways to each panel location in the event of unforeseen increases in electrical demand.

Power panels were placed about the building wherever required. Aside from the carpenter shop, the IBM equipment room and the tailor shop, the principal power load on the upper floors consisted of local air conditioning apparatus, existing and future, and exhaust fans. Spare breakers were included for future loads but provision for the future air conditioning was limited to the installation of blank fillers at panels which will feed this equipment. In this way initial costs were reduced without accruing any appreciable added expense to the final cost of the cooling system.

The new electrical distribution network represents a substantial improvement over the former dc system which delivered less than $2\frac{1}{2}$ watts per sq ft. The new installation will supply almost 7 watts per sq ft without modification.



FEEDERS ARE PULLED UP to new ac panels through main switchboard header before board itself is put into place. Four colors of 500 MCM RH-RW cable are drawn directly from jack-mounted reels, thus providing positive phase identification and eliminating the need for measuring off each riser before pulling.



MOTOR-DRIVEN WINCH pulling in cables is controlled by electricians who receive directions over sound power telephone. Winch line runs through a hole in the floor, then into conduit at panel immediately below. Old dc panel at rear was abandoned.



NEW LIGHTING PANELS overlap old dc panel boxes to permit use of existing branch conduits in rewiring. Conduit nipples (arrow) run into knockouts on one section of the two-piece screw cover specially fabricated for existing box.

Additional capacity may be obtained at any load center by pulling new feeders into the old dc conduit risers and tying into the spare breakers on any of the three main switchboards.

Lighting

The extent of the lighting modernization was of necessity limited by the extent of the revisions to the distribution system. It was decided to postpone work on the general lighting in order to do a more thorough job on the display lighting and the illumination of new sales and service departments.

The only exception to this plan was the installation of new fixtures for the main floor. This was desired in order to give customers an initial impression of a completely streamlined, up-to-date store interior. Surface incandescent units measuring 2½-ft square were installed, one per bay. Each assembly contains four 200-watt lamps and four Holophane lenses.

Perimeter lighting is an important element of the decorative motif in all of the store's selling areas. This is obtained from a continuous strip of one-lamp 40-watt fluorescent units mounted on the inner side of a valance running along the top edge of the built-in display cases and clothing racks. Besides providing ornamental illumination for the walls, these afford auxiliary lighting for the wall cases and racks, all of which are accented with interior-mounted fluorescent strips as well.

Throughout the building, general lighting was derived from pendant incandescent units located at the center of each 20- by 20-ft bay. Each fixture was rewired and adapted for 500-watt lamps and a more modern style of glassware. In this manner the minimum level of illumination was raised to 20 footcandles and it is planned to bring the general lighting up to at least 35 ft-c in stage III of the modernization plan.

Additional changes to the lighting included the installation of recessed fluorescent troffers at the island where the moving stairs are situated; accent lighting from adjustable pendant bullet spots; and special effects lighting for the luxuriant fashion salons.

Circuit Wiring

Fortunately, each of the original ceiling outlets was installed on a separate run of conduit so it was a simple matter to remove the existing deteriorated wire and pull in No. 12 TW branch circuits. Circuits for the accent lights were run to the nearest existing

ceiling outlet, then in new conduit which had been chased into the plaster then covered over.

New partitions were erected around the perimeters of each sales floor to provide dressing rooms and to recess the showcases and clothing racks. Lighting circuits for these locations were run concealed behind these walls in conduit and surface metal raceway.

The two large show windows were completely rewired to a capacity of 1000 watts per linear foot, well above the 200 watts per foot minimum specified in the NEC. Complete flexibility of display lighting is obtained by the installation of 20-amp 2-pole and ground polarized receptacles on 1½-ft centers along the top and sides of the windows. Each window is served by a 42-circuit panel having a remotely controlled magnetic switch across the main buses which is operated by a time switch with an astronomic dial.

Planning Pays Off

This project presents an excellent example of the benefits to be obtained from careful planning of a modernization project. The coordinated efforts of the consulting engineers, Smith & Silverman, the electrical contractor, Fischbach & Moore Inc. and the Ohrbach's chief engineer, Walter Thompson, effected a program for bringing the electrical system up to modern standards without increasing the final cost while keeping costly down time to a minimum. Another demonstration of the value of job engineering is the manner in which the extensive survey of the existing system revealed dollar-saving means of using original raceways and also ways of reusing certain fixtures and air conditioning equipment from the old Ohrbach's store.

Despite the limited amount of work included in Stage I of the program, the store presents an attractive, sales-inducing appearance because of the partially revamped lighting and, more important from the long view, it has a completely new distribution system capable of supplying anticipated power loads and an additional 500 kw in lighting at the point of utilization.

With the completion of the air conditioning installation this summer and the subsequent addition of a first rate commercial lighting system throughout the entire building, Ohrbach's will have obtained a modern, efficient store interior in the shell of a 50-year-old structure. This pattern will be repeated often in crowded city shopping districts where stores cannot afford the time required for complete reconstruction.



PLAN AHEAD WITH GRAYBAR

to start new buildings right...to keep old buildings humming

For both construction and maintenance Graybar stands ready to supply you with everything electrical — including sound technical assistance when you need it.

Graybar Specialists are available to work with you or your customers right from the blue print stage. Call on us, too, when there's a maintenance or modernization problem in power, lighting, ventilating, communications — all the major fields. The assistance of Graybar Specialists is another assurance that the electrical system you

install today will be adequate for future needs.⁴

And as for quality, everything supplied via Graybar is a top-notch product selected from over 200 of the nation's leading manufacturers. You select what you need, when you need it, from stocks of over 100,000 different electrical items in Graybar warehouses located coast to coast.

Remember, too, Graybar is wholly owned by its operating and retired personnel. Big order or small, you will always get careful attention from people eager to please.

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Graybar

ELECTRIC CO., INC., Executive Offices: Graybar Building, New York 17, N.Y.

IN OVER 120 PRINCIPAL CITIES



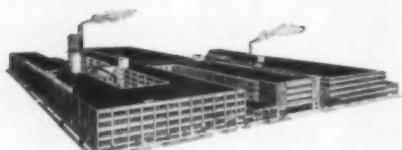
See the following pages for some of the quality products you can get when you

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Distinctive Packaging...

APPLETON

The Standard for Better Wiring



General Offices and Plant No. 1, Chicago, Ill.



Foundry Division, Plant No. 2,
Milwaukee, Wis.



Lighting Division, Plant No. 3,
Chicago, Illinois



Select wholesalers... APPLETON wholesalers... serve their customers from the distinctive APPLETON carton that typifies APPLETON's continuing program of research designed to build the finest in electrical fittings and supplies that money can buy.

The APPLETON carton is the visible symbol of APPLETON quality. Behind the carton are 3 great APPLETON plants with nearly 1,000,000 square feet of floor space where APPLETON engineering skill continues to mass-produce better products to sell at lower prices... one good reason why you should look for the famous APPLETON carton when you buy.

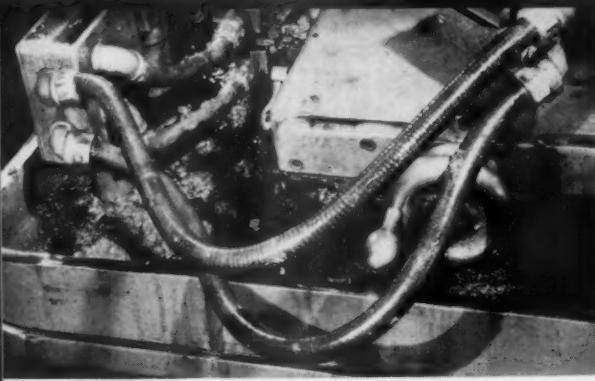
Sold Exclusively Through Selected Wholesalers

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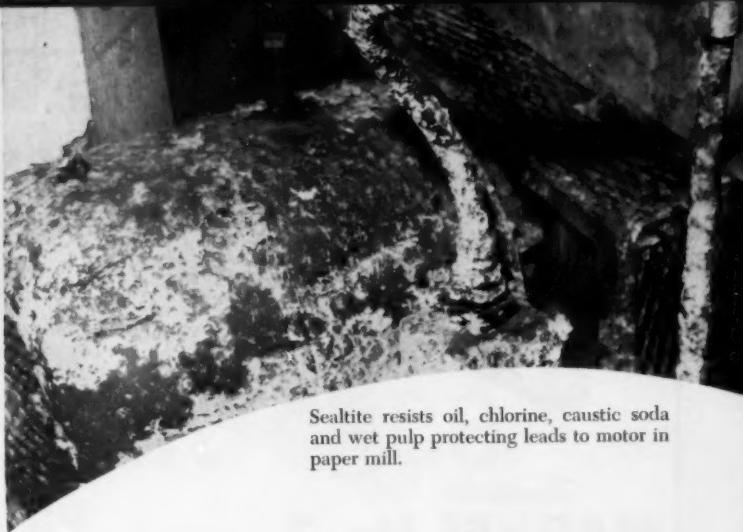
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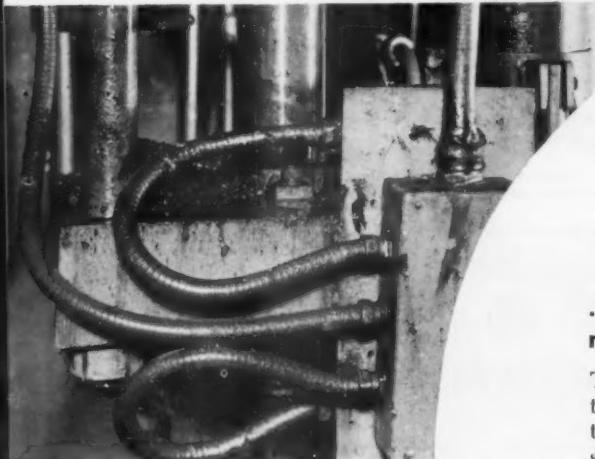
Plan ahead with GRAYBAR



Production grinder moves back and forth, continuously flexing Sealtite and spewing metal dust, oil and coolant over it.

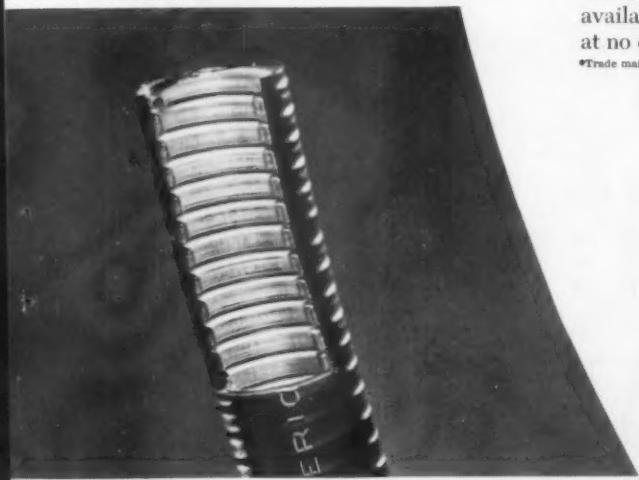


Sealtite resists oil, chlorine, caustic soda and wet pulp protecting leads to motor in paper mill.



Oil, grease and water from hydraulic press can't hurt wiring protected by Sealtite. Type E.F., used here, is extra flexible to make small-diameter U-bends, hug machine tool contours.

TYPE U.A. Sealtite flexible, liquid-tight conduit. Tough polyvinyl jacket over interlocked, zinc-plated steel strip. Copper conductor wound spirally in the space between each convolution on the inside of the conduit.



Give SEALTITE the dirtiest jobs around the plant

... this liquid-tight, flexible conduit protects wiring against moisture...oil...chemicals...weather...mechanical damage.

There are good reasons why you see Sealtite* protecting wiring on these dirty, critical jobs. It won't corrode. Nothing gets through its tough, extruded polyvinyl outer jacket. And day in, day out, Sealtite stands up under continuous flexing...gives maximum protection wherever wiring must connect moving parts...absorb vibration...follow contours...house wires with maximum protection. More, you save the installation time it takes to bend and fit rigid conduit.

TYPE U.A. is approved by Underwriters' Laboratories for service in wet spots. Copper conductor wound spirally inside conduit for positive ground.

TYPE E.F.† is extra flexible. Ideal for machine tool applications. Meets J.I.C. standards. Now available in machine tool standard light gray at no extra cost from mill stocks.

*Trade mark

5510GR

†Patent Applied For



ELECTRICAL WHOLESALERS stock both types in easy-to-handle coils. Buy it in long, random lengths; cut it on the job without waste. They also stock liquid-tight connectors. For complete information write: *The American Brass Company, American Metal Hose Branch, Waterbury 20, Conn.*

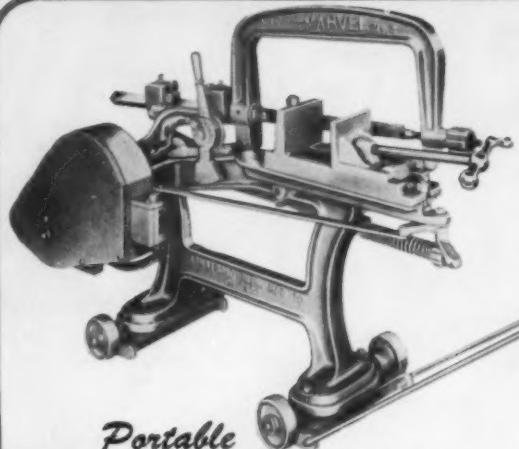
SEALTITE

FLEXIBLE,
LIQUID-TIGHT CONDUIT

an **ANACONDA**®
product

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Portable
MARVEL No. 2
DRAW CUTTING HACK
SAW MACHINE



MARVEL High-Speed-Edge Hack Saw Blades will out-cut all others because they have the finest high speed steel cutting edge. They will out-last other high-speed steel blades because they will not break or shatter—have a tough alloy steel body. By developing this composite construction, MARVEL produces a superior blade that will stand up under any speed, feed and tensioning, indefinitely. And fast, accurate, economical metal-sawing is possible only with high speeds, heavy feeds and a really taut saw blade. All sizes.

MARVEL Splitting Shears

Economically and accurately cut-off, split and trim flat steel plates and bars.



Model	No. 1	No. 2
Capacity (mild steel)	1/8"	1/4"
Length of shear blade	4"	6"
Length of lever	30"	54"

MARVEL Rod Cutters

These simple, hand operated tools easily and instantly cut-off round bars, rods or wire with a single stroke of the lever.



Model	Will cut Round Rods (dia.)	Weight, lbs.
No. 5	1/8, 5/32, 1/4, 3/16, 1/2	15
No. 6	1/8, 9/32, 1/2, 7/16, 3/4	45
No. 7	1/8, 3/16, 1/4, 1/2, 3/4	110

MARVEL Metal Cutting Saws
Better Machines—Better Blades

The best metal-cutting saw for the shop the best to have on the job

The MARVEL No. 1 (capacity 4" x 4") and the MARVEL No. 2 (capacity 8" x 8") Portable Hack Saws are the logical metal-cutting saws for electrical work both in the shop and on the job. They load easily on a truck and go to the point of work on their own wheels. They take the faster-cutting high speed steel blades and permit really effective feed pressures. (You don't have to wait to scratch your way through conduit, pipe, shapes or bars with these general purpose industrial hack saws, they really race through steel.) In their rigid frames, blades can really be pulled taut, and will cut straight and accurately. The No. 2 saw has a quick-action vise that swivels to permit angle cuts up to 45°; and in every way it is—

Fast . . . because the simple, rugged construction permits the use of high speed steel blades.

Accurate . . . because the improved Saw Frame with clamping type blade holders holds the blade in perfect alignment and proper tension.

Economical . . . because of its automatic relief on the return stroke, the blade will last and last and last.

Dry Cutting . . . because modern high speed steel blades will operate efficiently at 60 strokes per minute without a coolant.

MARVEL High-Speed-Steel Hack Saw Blades and Hole Saws

MARVEL High-Speed-Edge Hole Saws, because of this same MARVEL composite construction, have sufficient strength for use on drill presses and lathes as well as in portable hand drills. They will saw out holes at low cost in any machineable material (will go through steel plate up to 1 1/8" thick) easily and quickly. Until you've used a MARVEL Hole Saw you just can't know hole saw possibilities. Diameters from 5/8" to 4 1/2".

MARVEL Drill Press Vises

The sliding jaw is quick action—ratchets and screws tight. For drill presses, milling machines and shapers.



Model	No. 40	No. 41
Capacity	5"	8"
Width of Jaws	5 1/2"	7"
Height of Jaws	2 1/2"	4"
Overall length	12 1/2"	17 1/2"
Overall width	5 1/2"	7"
Overall height	4 1/4"	6"

ARMSTRONG-BLUM MFG. CO. • 5700 Bloomingdale Ave. • CHICAGO 39, ILL.



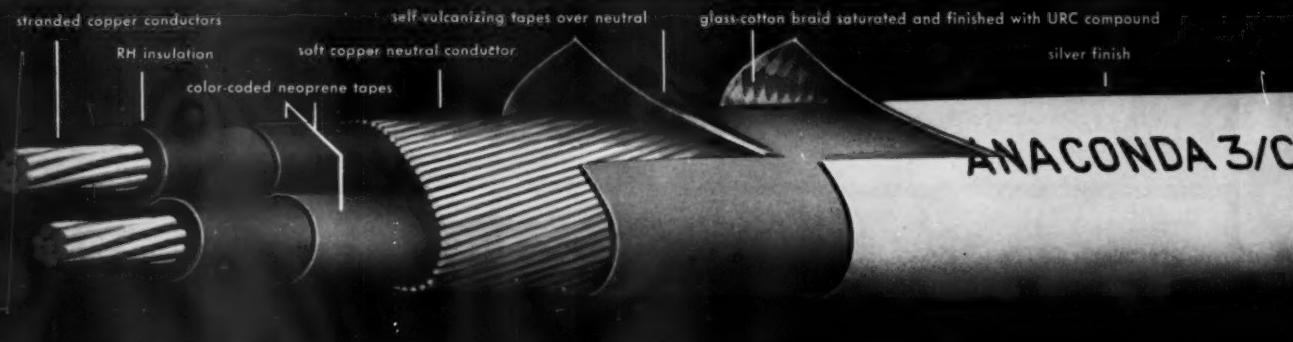
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ANAconda ANNOUNCES—NEW

SILVALINE 100-AMP

service entrance cable

The only SE cable with URC† saturant and finish



This new Underwriters Type SE service entrance cable enables contractors to meet new NAHB Voluntary Adequate Wiring Code—to wire up for today's and tomorrow's load.

The new Voluntary Adequate Wiring Code of the National Association of Home Builders calls for 100-amp service into the home.

Now, Anaconda introduces a new Type SE cable to help you take full advantage of this forward trend. It's Silvaline* 100-AMP cable—with actual capacity of 115-amps. Made with # 2 AWG copper—and Type RH insulation. And here are other advantages:

Eliminates Complaints. Silver finish on Silvaline takes any type or color of house paint...won't bleed through. Finish does not become sticky, won't flake or peel...will not mark walls. Flexible...clean and easy to handle.

Direct to Range. Silvaline can be installed from pole to house to meter in *one run* and then to range. No conduit is required. Fully approved. Saves time and money.

Uninterrupted Service. Silvaline is the only service entrance cable made with URC† saturant and finish. This weatherproof protection assures long life. There has never been a case of festooning or braid fraying with Silvaline.

Look for Silvaline 100-AMP at your Anaconda distributor. Available in sizes 3/c #2 AWG or 2/c #2 plus 1/e #4 AWG neutral. For informative bulletin on Silvaline, write: Anaconda Wire & Cable Company, 25 Broadway, New York 4, N. Y.

*Reg. U. S. Pat. Off.

§5531GR

†Utilities Research Commission

SILVALINE service entrance cable

ANACONDA

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GET THE RIGHT TOOLS FOR THE JOB! And Be Sure They're BEAVERS

BEAVER MODEL-E PIPE AND BOLT MACHINE

Threads $\frac{1}{8}$ " to 2" pipe, conduit or bolt—up to 8" with drive shaft and geared tools.

A rugged, lightweight pipe and bolt machine that can help you produce better work faster. Has Power Grip Wrenchless Chuck as standard equipment. All gears run in oil. Carriage travels a full 9½ inches with lever feed. Wheel or knife cut-off units are interchangeable. Has one-piece steel-weldment base, aluminum alloy head stock with bronze spindle bearings. Weighs about 190 lbs. Order today.



BEAVER MODEL-D ALUMINUM POWER DRIVE

Rugged, Powerful, Fast—
Low Upkeep!

Designed for one-man operation. Lightweight, yet strong enough for the toughest jobs. Has anti-friction bearings throughout. Motor is easily accessible without dismantling machine. Gears run in oil. Operates on bench or legs. Drives geared tools up to 8" . . . 12" under favorable circumstances. Has Power Grip Wrenchless Chuck as standard equipment. We stock it!

BEAVER PIPE TOOLS

210-300 DANA AVENUE • WARREN, OHIO, U.S.A.

BEAVER NO. 3 RATCHET THREADER WITH ENCLOSED RATCHET TEETH



Threads $\frac{1}{8}$ " to 1" pipe, $\frac{1}{8}$ " to 1" bolts, or $\frac{1}{2}$ " to 1" conduit. Can't clog or slip. Inverts for close threading. Easy to oil. Ample chip clearance.



BEAVER NO. 2 RATCHET THREADER WITH OPEN RATCHET TEETH

A rugged tool with interchangeable heads. For $\frac{1}{8}$ " to $\frac{3}{4}$ " pipe, $\frac{1}{8}$ " to $\frac{3}{8}$ " bolts, $\frac{1}{2}$ " to $\frac{3}{4}$ " conduit.



BEAVER 3-WAY THREADER

Perfectly balanced, ample chip clearance. Dies are inverted for close threading. Standard handles with long bosses for extra strength.



THE BEAVERETTE THREADER

One-piece, fully adjustable, plain or ratchet. Threads $\frac{1}{8}$ ", $\frac{3}{8}$ ", $\frac{1}{2}$ " and $\frac{5}{8}$ " pipe without changing dies or bushings. Radio-dial setting. Universal centering chuck . . . no bushings.



BEAVER NO. 26R THREADER

Threads 1" to 2" pipe or conduit with same dies by simple adjustment. No loose dies or bushings—fully adjustable.



BEAVER NO. 17 DROP-HEAD THREADER

Extremely rugged for tough, rough use. Cuts easily. For pipe or conduit. Dies on top for easy oiling and chip clearance. Threads pipe from $\frac{1}{8}$ " to 2", conduit $\frac{1}{2}$ " to 2".



BEAVER PIPE CUTTERS

Two new models designed for better, faster, easier cutting. No. 2 cuts $\frac{1}{8}$ " to 2"; No. 4 cuts 2" to 4". No. 2x and No. 4x are three-wheel cutters.



NO. 5 SQUARE END CUTTER

$\frac{1}{2}$ " to 2" pipe and conduit. No burrs. Knife feed automatic. No. 104, geared. 2" to 4".



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for Benjamin's traditional

"Better Built Quality"

specify



Commercial Lighting Units

It is good business to insist on units with "Better Built" features like those illustrated here. That's because such features help cut operating costs, speed up and simplify maintenance, and insure reduced obsolescence and long-life dependability.

It is good business for the user, because such units give better service and save more money. It is good business for those who recommend and install lighting equipment, because the installation of such units results in greater satisfaction and increased good will.

Shown here are but a few Benjamin Leader Line units, each with just one of its "Better Built" features. Manufacturing "Better Built" lighting equipment is a tradition with Benjamin. That's why you can rely on getting Benjamin Quality in every Leader lighting unit.

For a complete showing
of the Benjamin Leader Line,
send for our FREE CATALOG.

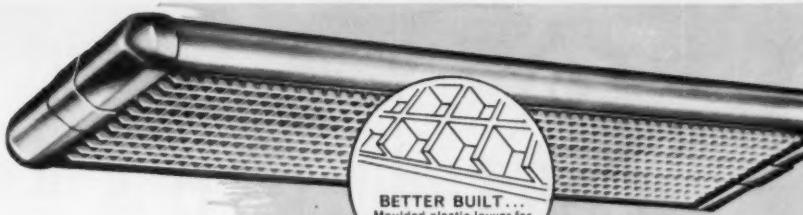
Exclusive licensees of the Leader Line in Canada:
Robertson Irwin Limited, Hamilton, Ontario



BETTER BUILT
TO SERVE YOU BETTER

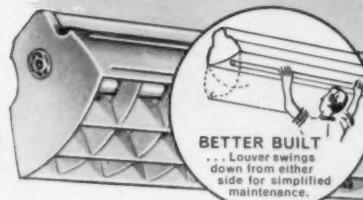
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Leader Division of Benjamin Electric Manufacturing Company, Dept. H, Des Plaines, Illinois . . . makers of famous Benjamin and Leader Line lighting equipment and sound signals for Industry, Institutions and Commerce.



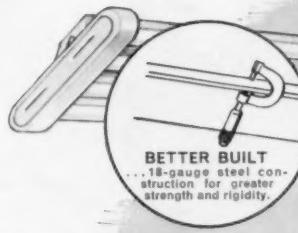
BETTER BUILT...
Moulded plastic louver for extra rigidity . . . resists distortion . . . and provides comfortable shielding.

The **OFFICER**
—a trim, slender fixture to provide distinctive lighting to commercial interiors.



BETTER BUILT
. . . Louver swings down from either side for simplified maintenance.

The **SCHOOLMASTER**
—an all-steel unit which provides upward light for comfort lighting, ideal for close seeing.



BETTER BUILT
. . . 18-gauge steel construction for greater strength and rigidity.

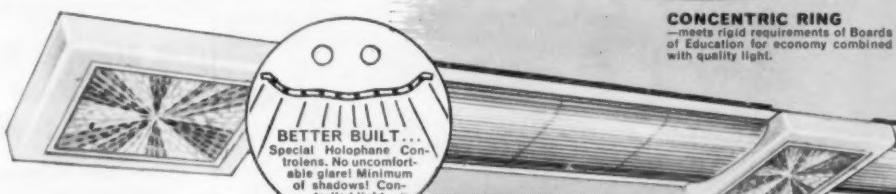
HIGH LEVEL OPEN SERIES
—designed for commercial interiors where maximum widespread illumination is desired, and low cost is a "must"!



BETTER BUILT...
Arrows indicate how air circulates to prevent dust from collecting.



CONCENTRIC RING
—meets rigid requirements of Boards of Education for economy combined with quality light.



TROFFERLITE with Holophane Controls—designed for locations where controlled quality lighting is desired.

*Copr., the Holophane Co.

BENJAMIN
TRADE MARK
Leader Line

Sold Exclusively through Electrical Distributors

Plan ahead with **GRAYBAR**



SOLDER CONNECTIONS



LOOSEN RUSTED TERMINATIONS



SPICE CABLES



MAKE RADIO REPAIRS



MELT LEAD



BEND CONDUIT



**THE
BERNZ-O-MATIC
MASTER
PROPANE
TORCH**



**Do these and many other jobs
FASTER...EASIER...
and more economically with Instant
Lighting BERNZ-O-MATIC® MASTER TORCH
with disposable propane gas cylinder**

No longer do you have to worry about bulky tanks, tangling hoses, fuel spillage, pumping and priming torches.

Now, you can have a lightweight torch that you can easily carry about in your pocket or tool case . . . or clip to your belt for pole work.

The Bernz-O-Matic Master Propane Torch offers you a host of other advantages. It lights instantly . . . even at 30° below zero. It has a disposable

propane gas cylinder that contains enough fuel for months of normal use. When the fuel is exhausted, simply throw the cylinder away and replace with another for the low price of \$1.95 (retail). The torch itself retails for only \$6.95.

There's another advantage to the cylinder, too. It seals itself, permitting you to change burners at any time during the life of the cylinder.

Accessories broaden uses of the torch



TX-2 • Utility burner for many general service uses. Permits attachment of flame spreader.



TX-300 • Flame spreader provides wide flame for burning off old paint for use with TX-2 burner unit.



TX-400 • Small soldering tip especially adaptable for soldering wires and other close electrical work for use with TX-10 torch.



TX-401 • Large soldering tip finds wide use in heavy-duty soldering for use with TX-10 torch.



TX-410 • Floor stand permits you to stand torch up while burning without fear of it falling.



TX-405 • Spark lighter for quick lighting of torches.

**THE BERNZ-O-MATIC BANTAM
PROFANE TORCH**



For light soldering and fine work use the Bernz-O-Matic Bantam Precision-Tip Torch with long-burning, disposable cylinder.

Instant lighting, goes into action immediately with a needle-fine flame for close work. Weighs only 1 lb. 6 oz. Fits neatly in pocket or tool box. Self-sealing disposable cylinder provides up to 15 hrs. burning time. Low cost—only \$4.95 (retail) replacement cylinder \$1.49 (retail).

"Always
Reliable"

OTTO BERNZ CO., INC., Rochester, N. Y.

"Since
1876"



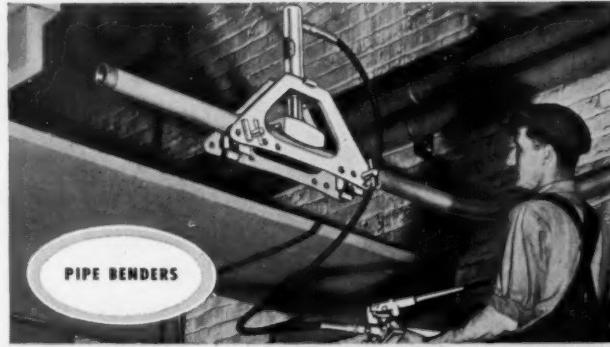
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"This hydraulic equipment keeps my men happier... more productive"

TO BEND RIGID OR THIN-WALL CONDUIT

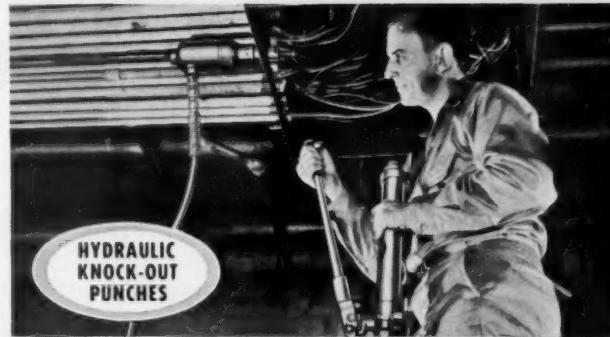
A Blackhawk hydraulic bender creates striking savings! It's *really* portable . . . and just plain handier! Works in any position — on its side or upright, on table or floor, on existing runs. With the hydraulic pump and ram separated by a flexible hose, a man can move around — "jockey" the pipe with one hand — sight along it if necessary . . . without stopping the pumping.



PIPE BENDERS

TO DRIVE KNOCK-OUT PUNCHES

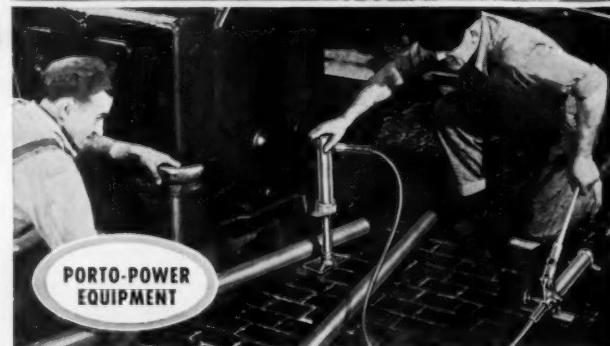
Look! No wrench to swing. No knuckle busting. No more distorted boxes. Now you can drive knock-out punches with the amazing "Porto-Power" hydraulic jack. It's 60% faster! Conduit openings are *neat* — workmen are happier, safer — dies last six times longer!



HYDRAULIC
KNOCK-OUT
PUNCHES

TO LIFT MACHINERY, PULL PULLEYS

The same "Porto-Power" hydraulic jacks that serve Blackhawk Electrician's Equipment lick dozens of allied jobs. With its all-directional ram, it can lift, pull, press, clamp, bend or push. "Porto-Power" wipes out scores of time-wasting construction and maintenance methods. Don't do it the hard way — *do it the hydraulic way!*



PORTO-POWER
EQUIPMENT



Yes, Blackhawk hydraulic equipment will make *your* crew happier, more productive. Today more than ever, it's important to give your men the best tools possible. And if you want to motorize your hydraulic equipment, the inexpensive P-182 portable electric pump provides finger-tip control, cuts manual labor, triples output. Order Blackhawk equipment from your wholesaler.

BLACKHAWK

HYDRAULIC PORTO-POWER EQUIPMENT

CLIP THIS COUPON AND MAIL TODAY!

BLACKHAWK MFG. CO.

Dept. P-2045, Milwaukee 1, Wis.

Please rush free Catalog 50B on
Blackhawk Electrician's Equipment

Name.....

Firm.....

Address.....

City..... Zn..... State.....



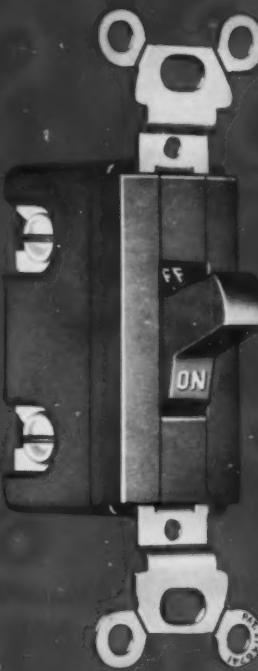
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No. 4801

15 Amperes 277 Volts
(Brown Plastic Housing)



No. 4901

20 Amperes 277 Volts
(Black Plastic Housing)

Use these BRYANT Quality AC Switches for Commercial and Industrial Installations

These rugged Bryant AC Switches mean real dollars and cents savings because they can be used to full rated capacity on fluorescent (inductive) loads. This means *twice* the capacity of existing switches — thus fewer switches are needed.

OTHER APPLICATIONS

- Capable to full rated capacity on Tungsten filament lamp loads
- Motor Control—will safely handle up to 80% of switch rating
- 277 Volt rating permits use on 4-wire 480/277 volt networks

QUALITY FEATURES

- Fine silver contacts to ensure long life
- Screw clamp terminals for easy wiring — straight in from the back
- Large head terminal screws for conventional side wiring
- Either wiring method accommodates up to No. 10 solid or stranded wire
- Fully enclosed in strong plastic housings — keeps out dust and dirt
- Meet all specifications

Listed by Underwriters'
Laboratories, Inc.

Both lines available in
Single Pole, Double Pole,
3 and 4-way Types with
Brown or Ivory Handles
and in Lock Types.



THE BRYANT ELECTRIC COMPANY
BRIDGEPORT 2, CONNECTICUT • CHICAGO • LOS ANGELES



Plan ahead with **GRAYBAR**



WITH

BRADY ALL-TEMPERATURE WIRE MARKERS

YOU GET ALL THESE BENEFITS BY USING BRADY MARKERS:

AVAILABLE LOCALLY — You can buy Brady Wire Markers locally from stocks in Graybar Houses from Coast-to-Coast. Graybar can give you either 1½" or ¾" long Markers — for large or small gage wires.

TWICE THE ADHESION — Brady's new B-500 All-Temperature self-sticking adhesive has twice the sticking power (32 oz. compared with only 16 oz. per inch of width). Brady Markers stick and stay stuck to any kind of wire . . . even when pulled through conduit.

HEAT RESISTANT — Brady Markers stick permanently to wires in continuous temperatures as high as 300°F. . . . intermittent temperatures to 450°F.

TWO SIZES OF MARKERS — Order Markers 1½" long for wires ¼" O.D. . . . ¾" long Markers for wires under ¼" O.D. You get twice as many ¾"

Markers at no extra cost. And ¾" Brady Markers don't bulk up on small gage wires.

CARDS WITH ROUNDED CORNERS — Only Brady Cards have Rounded Corners for smooth, catch-free handling. Won't snag pockets. Won't cut fingers causing "lost time" accidents.

STICK TO YOUR FINGERS from Card to wire. You can't drop Brady Markers. And your men won't lose time taking off tabs — Brady Markers come ready to use.

AND YOU GET THESE BENEFITS, TOO: Brady Markers increase your profits because they reduce your labor costs. They eliminate ringing out, tracing circuits, delays due to not knowing which wire goes where. Use Brady Wire Markers on every job and you will save labor costs on every job.

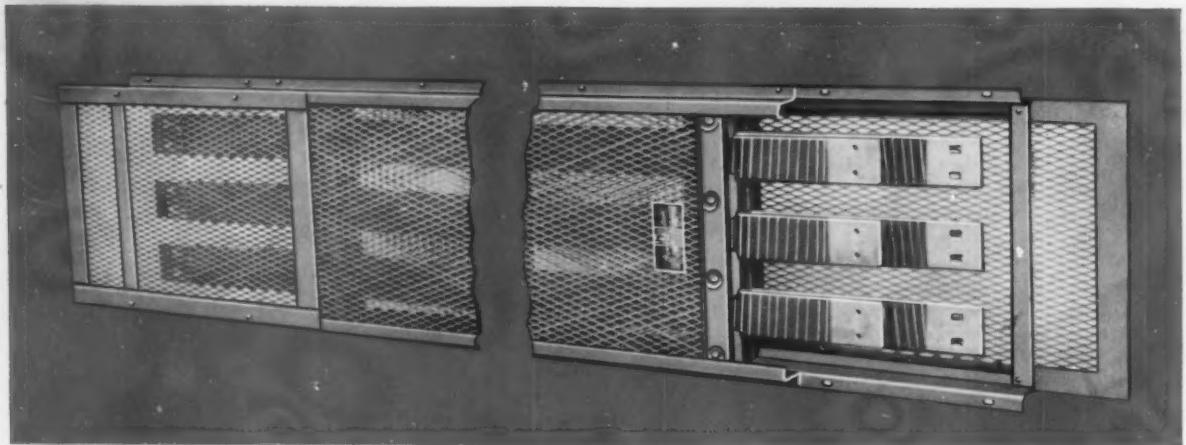
WRITE FOR 8-PAGE
BULLETIN AND FREE
USABLE SAMPLES

W. H. BRADY CO.

732 W. Glendale Ave., Milwaukee 12, Wis.
Est. 1914

Plan ahead with GRAYBAR



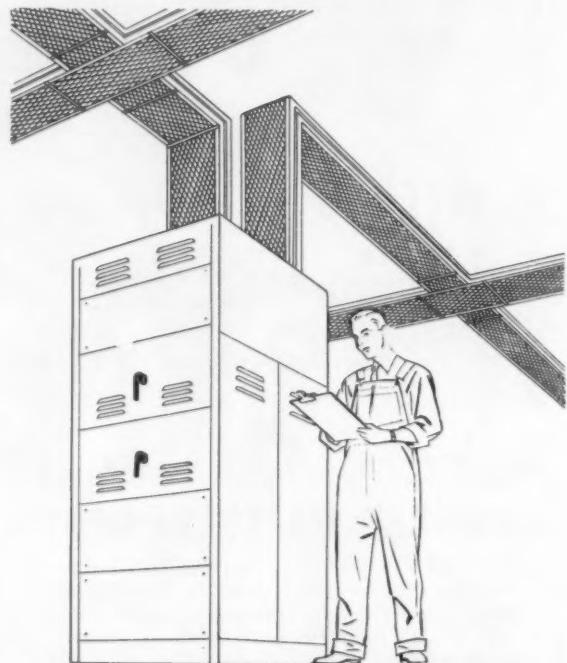


EXCLUSIVE SCARF-LAP CONSTRUCTION PROVIDES EXTRA-HIGH RIGIDITY AND STRENGTH. Duct sections come in tailored lengths, simply overlap and bolt together. Bulky, complicated joint fittings are eliminated. Elbows, tees and cross sections allow flexible installation anywhere. Exclusive paired-phasing arrangement assures lowest possible current carrying cost per ampere per foot.

BULLDOG LO-X BUS DUCT WITH LIGHTWEIGHT

Aluminum Bus Bars

costs less to buy—
less to install



EASIER TO HANDLE! LESS DEAD WEIGHT ON TRUSSES AND SUPPORTING MEMBERS!

You benefit two ways when you install BullDog Lo-X Bus Duct with lightweight aluminum bus bars: (1) Installation is easier. (2) You give customers a more flexible, more efficient feeder system.

The weight saved by using aluminum cuts handling and installation time. Lower first cost increases the saleability of BullDog aluminum bus duct. What's more, the lighter weight of the aluminum bus bars

eases the strain on building superstructures and other supporting members.

Dependable BullDog Lo-X Bus Duct is both efficient and flexible—can be easily relocated to fit any plant rearrangement. Let your BullDog Field Engineer or Qualified Distributor tell you about the many advanced BullDog products. Or, write: BullDog Electric Products Company, Detroit 32, Michigan. ©BEPCO

IF IT'S NEW
... IF IT'S DIFFERENT
... IF IT'S BETTER . . . IT'S



BULLDOG
ELECTRIC PRODUCTS COMPANY
A Division of I-T-E Circuit Breaker Company

Export Division: 13 East 40th Street, New York 16, New York. In Canada: BullDog Electric Products Company (Canada), Ltd., 80 Clayton Road, Toronto 15, Ontario.



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AND EVERY HY-LUG SIZE BETWEEN
WITH TOOLS AND DIES FOR ANY SIZE



BURNDY

NORWALK, CONNECT. — TORONTO, CANADA • Factories: NEW YORK, CALIF., TORONTO • Export: PHILIPS EXPORT COMPANY

Plan ahead with **GRAYBAR**





Plan ahead with **GRAYBAR**

"Our Welding Machines were repeatedly being shutdown . . until we changed to **Fusetron Fuses**"



"They eliminated production losses due to needless fuse blows."

"Our service shop is headquarters for the Detroit area of Fruehauf's operation. Trucks, tractors and trailers come in for repairs.

"As you know, motor carriers don't make money if they aren't hauling freight. It's our job to have the equipment rolling — and fast!

"But we were having trouble with shutdowns. Ordinary 60 ampere fuses were constantly blowing on our welding machines. We have 12 of these machines — that can be connected to 60 ampere switches located throughout the shop.

"Since many major repair jobs require welding, these shutdowns were really a serious problem for us.

"In an effort to avoid these shutdowns, we installed Fusetron fuses. Since changing, there hasn't been any needless fuse blowing on the welders. Fusetron fuses completely eliminated the trouble."

Clyde Parkins CHIEF ELECTRICIAN
Detroit Branch • Fruehauf Trailer Company,
Detroit, Mich.



Plan ahead with **GRAYBAR**



EVERYONE IN THE PLANT CAN BENEFIT BY USING FUSETRON dual-element FUSES.

To Electrical and Safety Engineers Fusetron Fuses Offer Maximum Safety



The 100,000 amp. interrupting rating of Fusetron fuses is ample with the high capacities of today's network systems — and they are adequately safe to meet future circuit growth.

Fusetron fuses reduce the expense of damaged equipment and the danger of fire and other hazards that can result from electrical faults because — they protect against short-circuits, harmful overloads and single phasing.

To Production Engineers Fusetron Fuses Offer Increased Production



Down-time is reduced, because Fusetron fuses wipe out needless blows caused by harmless overloads or excessive heating of panels or switches.

HERE'S WHY FUSETRON FUSES GIVE ALL-PURPOSE PROTECTION

A fuse link combined with a thermal cutout — the result, a fuse with tremendous time-lag and much less electrical resistance and an interrupting rating in excess of 100,000 amps.

They have the same degree of Underwriters' Laboratories approval for both motor-running and circuit protection as the most expensive devices made.

Made to same dimensions as ordinary fuses, FUSETRON Fuses fit all standard fuse holders.

Obtainable in all sizes from 1/10 to 600 ampere, both 250 and 600 volt types. Also in plug types for 125 volt circuits.

Their cost is surprisingly low.

Write for bulletin FIS.



FUSETRON is a trademark of the Bussmann Mfg. Co.,



To Maintenance Engineers Fusetron Fuses Offer Savings in Time and Work

Once properly installed, Fusetron fuses require no periodic inspection or down-time necessary on mechanically operated devices.

They protect against irritating interruptions of regular maintenance caused by needless blows. Unnecessary repair work is reduced because — if trouble occurs, Fusetron fuses open and warn of danger before motors or equipment are damaged.

Panels and switches are protected against damage due to poor contact heating.



To Top Management Fusetron Fuses Offer Reduced Costs

Fusetron fuses cut maintenance costs because they are maintenance free — they increase life of equipment by guarding against damage caused by electrical faults — and they lower production costs by eliminating shutdowns due to needless blows.

They save waste of space and money by permitting use of proper size panels and switches, instead of oversize.

FOR LOADS ABOVE 600 AND UP TO 5,000 AMPS . . . USE BUSS HI-CAP FUSES . . .

They have unlimited interrupting capacity to handle any fault current regardless of system growth.

They can be coordinated with Fusetron fuses on feeder and branch circuits to limit fault outages to circuit of origin.

Write for bulletin HCS.



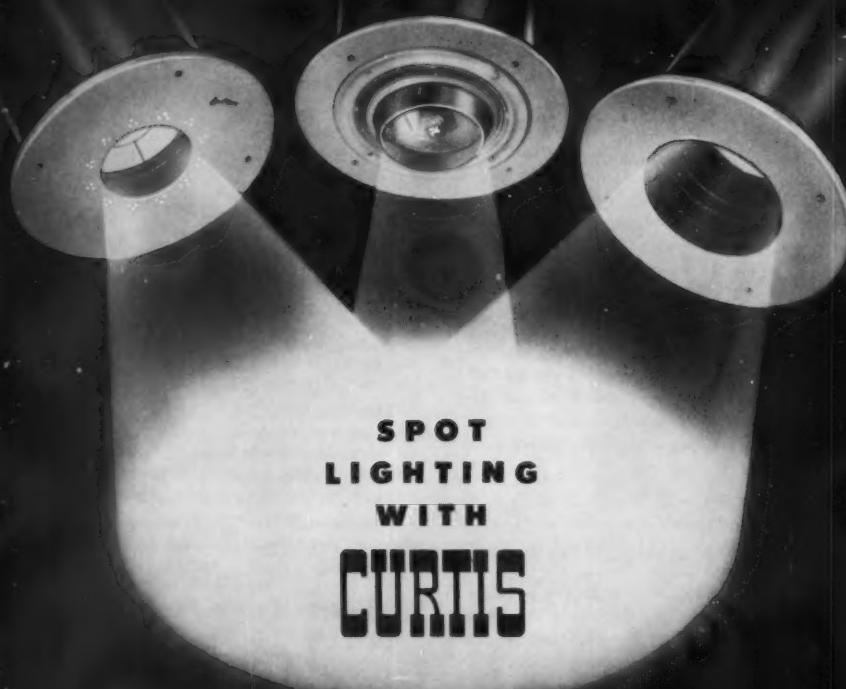
555

**Play Safe! install Fusetron and BUSS Hi-Cap
Fuses throughout the entire Electrical System.**



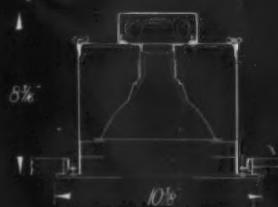
BUSSMANN MFG. CO. (Division of McGraw Electric Co.)
UNIVERSITY AT JEFFERSON ST. LOUIS 7, MO.





**SPOT
LIGHTING
WITH
CURTIS**

"VARI-SPOT"



CATALOG No. 2246.

Curtis "Vari-Spot" is a shallow recessed downlight, utilizing one 100-watt inside frosted incandescent lamp. It is designed for use in residential and commercial interiors. An adjustable Alzak aluminum reflector permits the diameter of the circle of light to be controlled and changed as desired. Decorative holes in the finishing ring provide an attractive light pattern at the ceiling.

"PUNCHY"



CATALOG No. 2240.

Curtis "Punchy" is a shallow recessed adjustable downlight utilizing one PAR-38, Side Prong 150-watt projector spot or flood lamp. It is designed to provide punch lighting for counters, displays, show windows and other areas in store interiors.

"Punchy" features an exclusive aluminum gimbal ring which permits adjustment of the lamp to any angle 0° to 35° from the vertical, and 0° to 360° horizontal.

"SPOTTY"



CATALOG No. 2244.

Curtis "Spotty" is a shallow recessed fixed downlight utilizing either one PAR-38 or R-40 screw base 150-watt spot or flood lamp. It has wide application for accent, supplementary and general lighting.

Three horizontal steel baffles, an integral part of each unit, are designed and positioned to provide an exceptionally low-brightness incandescent unit at normal viewing angles.

WRITE FOR FREE DESCRIPTIVE LITERATURE

Curtis Lighting, Inc., 6135 W. 65th Street, Chicago 38, Illinois



Plan ahead with GRAYBAR

Cordley

gives better performance

Because it has more to give!

...THESE FOUR NEW FEATURES
FOR '55 MEAN GREATER
ECONOMY FOR WATER COOLER USERS!



NEW FOOT PEDAL—In factories and elsewhere, nuts, bolts or other small articles may become lodged under a conventional solid pedal, impeding its action. With Cordley's new tubular stainless steel pedal, this just can't happen! That's not all. In addition all Cordley standard bubbler models are equipped with a feather-touch push-button . . . thus dual flow controls at no extra cost!

TRIPLE COOLING—with New, More Efficient System—Recognize this? Yes, it's a water cooling system. It looks smaller though, doesn't it? And it is! Cordley engineers found that this smaller tank, coupled with Cordley's pre-cooling and flash cooling action, is actually far more efficient, and has greater capacity, than older, bigger tanks. Better service, lowered power consumption with new Cordleys!

DUAL TEMPERATURE CONTROLS—Cordleys can't freeze up . . . a separate thermostat provides this extra protection on all standard bubbler models at no extra cost.

and

BROADER GUARANTY—in addition to other unique features, covers replacement of the entire cooler within 5-years including transportation both ways.

These four new features on Cordley models for '55 exemplify the continuous engineering and design improvement that goes into Cordley Coolers. Because Cordleys are built for performance . . . with more quality features than any other single make . . .

CHECK AND COMPARE!

- 18 quality features found together in no other single make
- Many models, to meet every need and capacity requirement
- New tubular foot pedal is fool-proof—can't be jammed
- Dual hand and foot controls
- New water-cooling system is more efficient, uses less power
- Best 5-year guaranty in the entire industry.
- Attractive, simple styling . . . Cordleys "fit in" everywhere

CORDLEY & HAYES

Since 1889 . . . First in Water Coolers . . . Over 1,000,000 Sold

Plan ahead with **GRAYBAR**



*Call Graybar
and ask about*

DAY-BRITE

**"COMFORT-LIGHTING"
FIXTURES**

The new Day-Brite CFI (Comfort For Industry) fixture — available for high-output, rapid-start lamps — appeals widely to plant men because it boosts worker morale and efficiency.

By combining both downward and upward lighting, the new CFI fixture washes out ceiling brightness contrasts and greatly reduces worker discomfort resulting from "eye shock." This gives contractors a strong selling point.

FOR HIGH-OUTPUT, RAPID-START LAMPS

There are two new "Comfort For Industry" Day-Brite lifetime fixtures — the CFI-10 and CFI-25. Each will accommodate the new 8-ft. High-Output, Rapid-Start lamps.



*for high-output,
rapid-start lamps*

CFI-25

COMFORT FOR INDUSTRY

DAY-BRITE
RLM

CFI Fixtures

meet RLM Specification Numbers D-1, D-2, and SD-1.

SEE!

EXAMINE!

COMPARE!

Then choose Day-Brite CFI fixtures—
their superiorities are self-evident.



Day-Brite Lighting, Inc., 5402 Bulwer Avenue, St. Louis 7, Missouri.

5446

CFI-25 with 25% upward lighting component and 30° crosswise shielding

Two-lamp units are available for the newly developed 8-ft. High-Output, Rapid-Start lamps. Also available are two-lamp units for 8-ft. Slimline lamps and for 4-ft. Rapid-Start lamps. All-steel, reinforced construction is used throughout, including reinforced die-embossed ribbing to insure greater reflector rigidity — reflectors are one-piece all porcelain enamel, the LIFE-TIME FINISH. The truss-like channel features a ribbed top section, so that sliding clamp hangers may be positioned anywhere along the run.

CFI-10 with 10% upward lighting component

Two-lamp and three-lamp fixtures engineered to provide a 10% upward lighting component, the CFI-10 is basically similar to the CFI-25.

NATION'S LARGEST MANUFACTURER OF COMMERCIAL AND INDUSTRIAL LIGHTING EQUIPMENT



Plan ahead with **GRAYBAR**

fill all your portable hoist needs from one reliable source

OVER A HUNDRED SIZES AND MODELS OF COFFING HOISTS



Ask for more information on the units you need from the most complete line of hand-operated hoists. Write Dept. EC4.

Coffing Hoist Division
Duff-Norton Company
Danville, Illinois



Plan ahead with **GRAYBAR**



**Get More Dependable Protection
for Motors and Branch Circuits**

ECON®

The exclusive Econ-Alloy thermo element in Econ Dual-Element Cartridge Fuses has the property of changing from a solid to a liquid without going through a plastic state. We utilize this property to assure you more uniform protection against overloads and shorts for motors and branch circuits.

This high precision fuse design provides the most accurate control of blowing time and also acts as a guard against high temperatures and their resulting hazards.

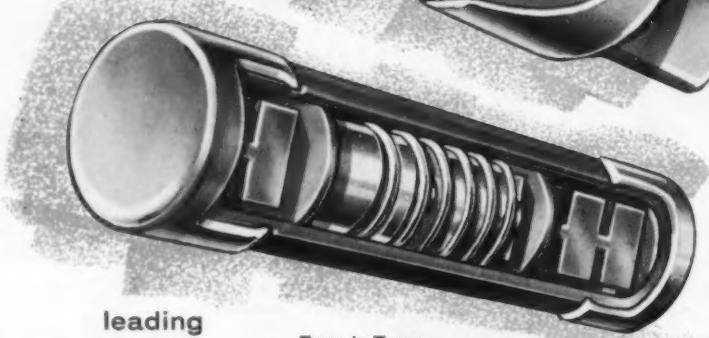
Econ Dual-Element Fuses are available in both knife and ferrule types, 0 to 600 amperes, 250 to 600 volts.

Underwriters' Laboratories approved.

Write for new Econ Catalog S-60 or for literature on other type fuses in which you are interested.

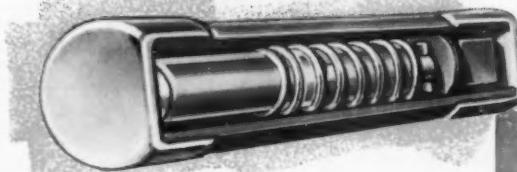


Knife Type



Ferrule Type

leading
electrical wholesalers
stock ECON fuses



ECONOMY fuses for every purpose

ECONOMY FUSE & MFG. CO., 2717 Greenview Ave., Chicago 14, Ill. R-917EC

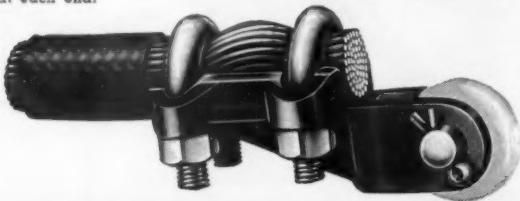


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Efficiency

CABLE STRAIN CLAMP

Capable of withstanding a direct pull of over 12,500 lbs. before slipping, this clamp can be furnished either with eye or clevis. Three clamp sizes accommodate all cable sizes from 1/8 to 1,500,000 c.m. Constructed of malleable iron, this clamp has a high ridge across the center of the cable channel and a U-bolt at each end.



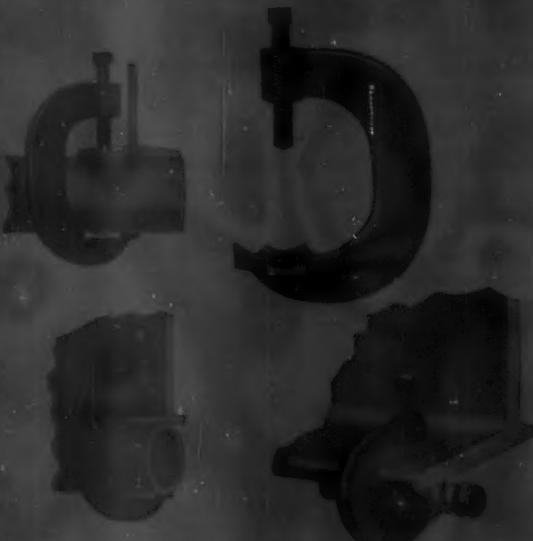
NON-MALLEABLE
INSULATOR SUPPORT

INSULATOR
SUPPORT



CONDUIT HANGERS

Correctly designed for carrying armored cable or $\frac{1}{2}$ " to $2\frac{1}{2}$ " pipe along open steel construction. Radiating ridges and the live point gripping surface keeps the pipe suspended dead center, with the set screw above permitting the cable or pipe to be carried at any angle. Made of highest quality malleable iron.



SUSPENSION DEVICES

ARE TIME AND COST SAVERS

By eliminating the need for punching, drilling or burning through beams in order to hang electrical mountings . . . Efficiency Suspension Devices can save you time and expense on practically every construction job.

BUSHING MESSENGER SUPPORT

This support is designed to suspend wire or cable from messengers where beam mounting is not possible. This support is a combination of our Type G Bushing Support with strip steel messenger attachment. Furnished complete with malleable iron support, steel messenger attachment and all bolts, as illustrated.



BUSHING SUPPORTS

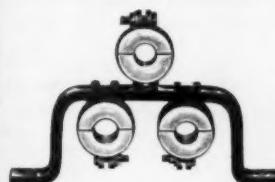


Designed to eliminate the drilling of holes for mounting, these supports are adjustable to any angle. Made of malleable iron with highest quality split porcelain, they are furnished for AC-DC service to handle $5/16$ " to $2\frac{1}{8}$ " cable. Type G is clamp-mounted, while Type VB and VG bolt mounted through its circular base.

BUSHING RACKS AND SUPPORTS



Available in 2, 3, 4, 5 and 6 bushing racks for AC or DC service. Only a single bolt is required to support the bushing and clamp the support to the rack. For $5/16$ " to $2\frac{1}{8}$ " wire sizes.



NESTED BUSHING RACKS AND SUPPORTS

Simply and compactly designed to carry conductors equidistant from center to center. Each bushing is a separate unit, allowing independent installation of each cable line. Available in 2, 3, 4, 5 and 6 bushing racks.

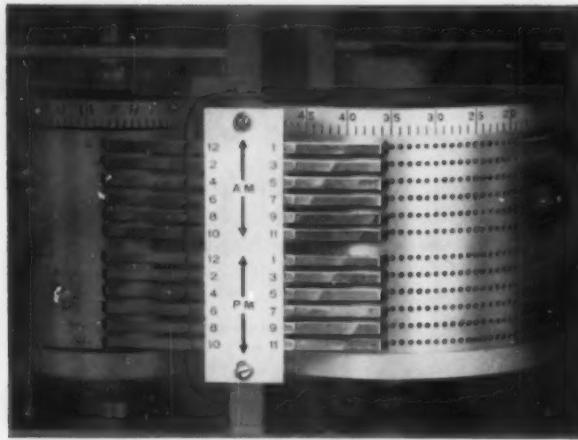
EFFICIENCY ELECTRIC AND MANUFACTURING COMPANY

Write for Catalog

East Palestine, Ohio

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it's
so simple . . .

Here's the answer to most programming problems . . . the Edwards Program Control. It schedules personnel activities, lunch hours, rest periods in factories, offices and institutions . . . operates utilities. Even makes an ideal guest call system for motels.

Signals are set for any minute by the simple insertion of metal pins.
No discs, drums, ribbons or cylinders to adjust or remove.

Operates automatically any minute of a 24-hour day, 7-day week. Signals can be varied from 3 to 10 second duration, and can also be operated manually or cut off entirely without disturbing program setting.

Like all other Edwards equipment, the Edwards Program Control is engineered for easy installation, simple operation, long, trouble-free life.

TWO TYPES: Single Circuit for single schedules; Multiple Circuit for staggered schedules. Send for your copy of "Centrally Controlled Clock and Program Systems." Edwards Co., Dept. G-4, Norwalk, Conn. In Canada, Owen Sound, Ont.

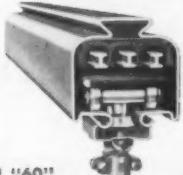
EDWARDS *Clock and Program Systems*
for SCHOOLS • HOSPITALS • OFFICES • INDUSTRY!



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FEEDRAIL® Trolley Busways

Handy Selection Guide



FEEDRAIL "60"

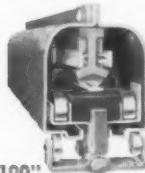
Applications: Budget hoists, light tonnage monorails, small portable tools, lighting, cutting and sewing equipment.

Capacity: Continuous current rating—60 amperes; 250 volts A.C. or D.C.; 2 or 3 pole.

Track: Plain, curved, door, sectionalizing and transfer sections.

Trolleys: 15 Amperes, fusible and non-fusible. New special service 20 ampere fusible and non-fusible trolleys for use with budget hoists and monorails. 8 ampere plug-in jacks for stationary service.

Additional data in Bulletin No. 45.



FEEDRAIL "100"

Applications: Cranes and hoists, portable tools, production and test lines, machine tools, airport hangar doors.

Capacity: Continuous current rating—100 amperes; 575 volts A.C. or 250 volts D.C.; 2 or 3 pole.

Track: Plain, curved, door, sectionalizing and transfer sections.

Trolleys: 20 and 30 ampere fusible and non-fusible types, with and without receptacles, to meet a wide range of requirements. Non-fusible crane and hoist trolleys in 30, 60 and 100 ampere capacities.

Additional data in Bulletin No. 40.



FEEDRAIL "HEAVY DUTY"

Applications: Heavy duty cranes and hoists, large machine tools, conveyor assembly lines.

Capacity: Continuous current rating—225, 375 and 500 amperes; 575 volts A.C. or 250 volts D.C.; 2 or 3 pole.

Track: Plain, door and expansion sections.

Trolleys: 225 amperes with bottom or side outlet.

Additional data in Bulletin No. 35.



Feedrail is the safe, dependable way to distribute electrical power to moving or stationary equipment.

The modern Feedrail Trolley Busways eliminate the problems and troubles of open wiring, accidental contact, and long trailing cables. All current-carrying components are protected by sturdy steel housings. Easy rolling trolley outlets, supported by the protective track housing, take off power from the bus bars at any point along the length of a run. There's no chance of broken conductors suddenly interrupting operation. The entire installation is compact, out of the way and trouble-free.

Track, trolleys and accessories are soundly engineered and built to high precision standards that mean long life. Its design includes every provision for fast, easy installation—maximum safety and dependability.

FOR FULL DETAILS write for descriptive literature. We can help you better if you state your requirements. Address Dept. C-4.

G4-1



Never Becomes Obsolete

FEEDRAIL CORPORATION

Subsidiary of Russell & Stoll Company, Inc.
125 BARCLAY STREET • NEW YORK 7, N.Y.

SPECIALLY QUALIFIED REPRESENTATIVES IN PRINCIPAL CITIES

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NEW!

Labor costs cut more than 50%

ON CONTINUOUS RUNS OF
GARCY LIGHTING INSTALLED

with new Speed-line® system

PATENT PENDING

WITH Speed-line
FIXTURES ARE
PRE-ASSEMBLED
AND PRE WIRED
AT FLOOR LEVEL

no separate external
mounting channel
needed



No extra mounting channels are used with Garcy Speed-line . . . saves cost and bulk. Garcy "joiners" connect super-reinforced Garcy Fixtures into rigid, easily-handled units . . . straight as a die.

WITH Speed-line
ENTIRE RUN IS
RAISED TO CEILING
AS A SINGLE UNIT
... and uses
fewer stem hangers



No straining at top of ladders. Simply hook Garcy Stem Hangers into hicieys and then connect house wiring.

Here's another great saving! Fewer hangers are needed . . . improves appearance, saves cost of hangers and installing extra hicieys.

WITH Speed-line
YOU CAN DELIVER
PREMIUM LIGHTING
AT THE COST OF
STANDARD FIXTURES

What a boon to contractors! The savings in labor cost enable you to quote a lower total price . . . and still furnish the highest quality commercial fixture made, the Garcy VISUALIER. Speed-line installation techniques were specially developed to take full advantage of the Garcy VISUALIER's unique design features. Separate, lightweight wireways are easiest to handle. The separate, one-piece shielding bodies may be left in cartons, safe from dust and damage, until the job is ready to lamp and light.

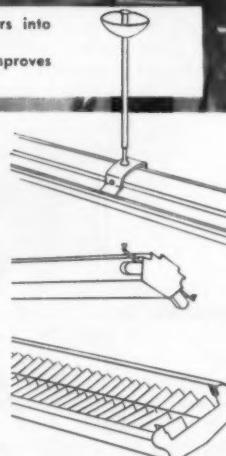
Be the first in your area to offer this contract-winning advance. For budget jobs Speed-line is also available with Garcy's Gar-See-Lite fixtures.

Send today for Bulletin 551-L.

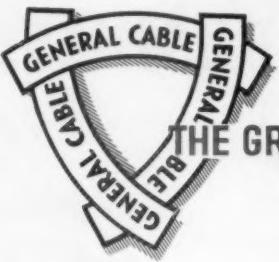
GARCY Quality by Design

GARDEN CITY PLATING & MFG. CO., 1730 N. Ashland Ave., Chicago 22, Ill.

In Canada: Garcy Co. of Canada, Ltd., 191 Niagara St., Toronto



Plan ahead with **GRAYBAR**



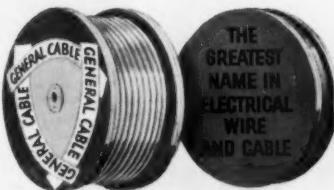
THE GREATEST NAME IN ELECTRICAL WIRE AND CABLE



To wire a plant, or wind a coil

IT PAYS TO BUY IN ONE PLACE!

Actually there is only one source for all of the types of wire and cable you may need...that's General Cable. To meet your every requirement, General Cable manufactures bare, weatherproof and insulated conductors of every variety...maintains vast stocks...the broadest distribution facilities in the industry...ultra-modern plants coast to coast. Specify "General Cable." Don't settle for less.



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INVITATION TO NEW BUSINESS

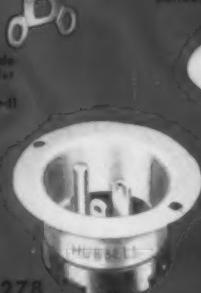
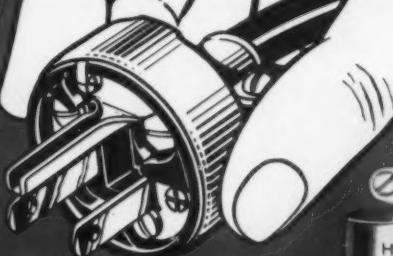
A COMPLETE LINE OF 3-WIRE GROUNDING DEVICES TO MEET CODE REQUIREMENTS



NO. 5262
Application Grade
Grounding Outlet
Designed to replace
"central shell" type.



No. 5273-L
Heavy-duty
Composition Adapter
designed to replace
"central shell" type
supplied with
portable tools.



No. 5278
Motor Plug Base (female)
fitted with 2279 jaws.



No. 5279
Motor Plug Base
(female)
O.E.M. and lab. use.



No. 5252
Comprehensive grade
intermediate outlet
for residential
applications.



No. 5264
Rugged 3-wire caps
with U-shaped blade
for grounding.



No. 5266
Rubber cap
with cord grips.



No. 5274
Finger-grip 2-prong cap.

Wherever grounding is a "must," the 3-wire cap with U-shaped grounding blade, shown above, is your invitation to bigger, more profitable business. As you know, it is required by N.E.C. and U.L. on many types of portable electrical equipment rated 125 volts or less.

Point is this: some of your industrial customers are going to be surprised when they receive portable tools and machine tools equipped with this new 3-wire cap. It will present a plug-in problem . . . unless they have the receptacles, adaptors, connectors, etc., to accept the new U-shaped grounding blade.

Don't miss this chance to sell them the devices they'll need. Hubbell's complete grounding line meets every requirement, satisfies the top industrial standard for rugged, dependable performance.

Also a complete line of 250-volt rated
grounding devices.

Literature on request.



FACTORY WAREHOUSE LOCATIONS ASSURE
NATIONWIDE STOCK AVAILABILITY

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HARVEY HUBBELL, INC., DEPT. C-1 BRIDGEPORT, CONNECTICUT

15HH55



Plan ahead with **GRAYBAR**

new LIGHTWEIGHT Greenlee Bender

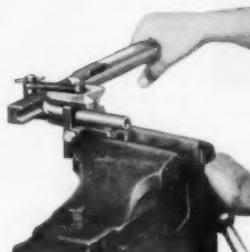
easy portability...
extra versatility...
extra power... 15 tons!

Here's the kind of real portability you've been looking for in a bender for $\frac{1}{2}$ " to 2" conduit. New GREENLEE No. 880 Hydraulic Bender of advanced type construction is unusually *lightweight*, yet extra rugged, fast, *powerful*. Easily carried by one man . . . easily operated by hand, or can be used with a power pump for fast production jobs. Makes complete 90° bends with one ram stroke. Quickly pays for itself in time and materials saved. Get complete details from your electrical distributor.



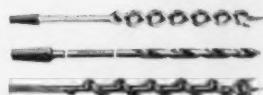
Knockout Punches and Hydraulic Punch Driver

Quick, easy way to make knockout enlargements for $\frac{3}{8}$ " to 4" conduit. Simply insert GREENLEE Knockout Punch in knockout or small drilled hole, then turn with an ordinary wrench. For an even faster, practically effortless operation, drive Punch with powerful, portable GREENLEE Hydraulic Driver shown below.

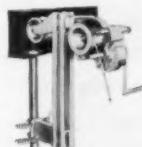


Hand Benders for Tubing

Swiftly produce accurate small-radius bends (up to 180°) in conduit, pipe, and tubing. No flattening or kinks. GREENLEE Hand Benders are especially designed to form neat bends to fit sharp corners, nooks, and other close quarters. Eliminates need for many manufactured bends and fittings. Various sizes and models . . . handy companion tools to GREENLEE Hydraulic Benders for quickly "custom making" your own complete conduit installations right on the job.



Boring Tools For quickly making clean, smooth openings for conduit and wiring. The GREENLEE line includes Electricians' Auger Bits and Electric-Drill Bits, Bell Hangers' Drills, Expansive Bits, and Bit Extensions.



Cable Puller Easy-operating, compact unit for 7,500-pound pull. Fastens directly to conduit for pulling in line with conduit . . . no loosened hangers. Attachment available for concealed conduit work.

SEE YOUR ELECTRICAL DISTRIBUTOR! Get complete information on the above and other GREENLEE inventing tools: Jaws Drives • Radio Chassis Punches • Anchor Screw Expanders • Chisels and Gouges • Spiral Screw Drivers • Electric-Drill Bits • Automatic Push Drills • and many more. Greenlee Tool Co., 1744 Columbia Avenue, Rockford, Illinois.

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Handle these... and others... with the job!*



ELECTRICIANS TOOLS

THE TOOLS

Electricians
ask for!



REEL GIVES BIG GRIP ... NO SLIPPING

Other IDEAL Fish Tapes

Flat tape (without reel)
50 to 200 foot lengths

Coil Flex — spring type

Nylon Covered

Round — for easier pulling in
small conduit



FISH TAPE REEL and PULLER

**THE 3-IN-1
TOOL THAT
SPEEDS "FISHING"
PROTECTS TAPE
AND HANDS . . .**

Here's a combination tool that "saves your back" and cuts fishing time up to 50%. Reel lets you pull *full force* without bending or kinking tape—protects hands—does away with special pliers, pullers or bare hand pulling. Tape is reeled in and pulled through conduit in *one* operation. It is always under control — either on the reel or in the conduit. No kinked or snarled tape to waste time—no loose tape to spring into machinery or "hot" lines.

Tape is finest grade, flat spring steel, oil tempered for maximum strength and flexibility. Steel is enameled to prevent rusting. No sharp edges to cut hands. Five sizes in tape lengths of 50 to 200 feet.

**IDEAL makes a complete line of wiring tools—
to help you do any wiring job faster, easier, safer.**



IDEAL INDUSTRIES, Inc.

1041 Park Avenue, Sycamore, Illinois

**THESE IDEAL TOOLS
Pay Off in FASTER WIRING**



IDEAL WIRE LUBE

Lubricates Wires for Faster, Easier Pulling . . . Protects Insulation.

Dries to fine powder; also makes it easy to remove wire from conduit or add wires. Non-corrosive, non-combustible, harmless. For use on rubber, lead or plastic covered wire cable (not for use on asbestos covered.) In quart to 5-gallon containers.

IDEAL VOLTAGE TESTER

**Super Safe — Double
Protection — Can't Fail
to Detect Voltage**

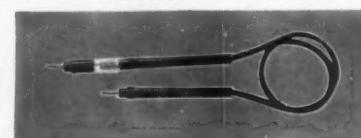
Has both a solenoid, calibrated indicator and a neon test lamp — each independent of the other. No chance of failure to detect voltage. New, handy center mount for the prod keeps indicator and test lamp always in line of vision. Tests 110 to 550 volts AC—110 to 600 volts DC.



IDEAL "E-Z" STRIPPERS

Patented, No. 2,179,581
Durable, All-Steel Construction

— Fast — Easy to Use
Automatic lock prevents snap back and crushing of stranded wire. Positively will not score or damage wire. Eight sizes for practically all wire gauges, also TV downlead and most non-metallic sheathed cable.



IDEAL INDUSTRIAL "TEST-GLO"

Safe, Easy-to-Use Test Light for Electrical Circuits, Sparkplugs, Motors, Fuses, Etc.

Highest quality resistors between test-prod and lead reduce voltage reaching the leads to harmless level. Safety rings prevent accidental contact with prods. Long handles. Enclosed neon test lamp always in line of vision. Glows on 80 to 600 V. AC or DC. Leads are 24" long.



IDEAL DELUXE CABLE RIPPER

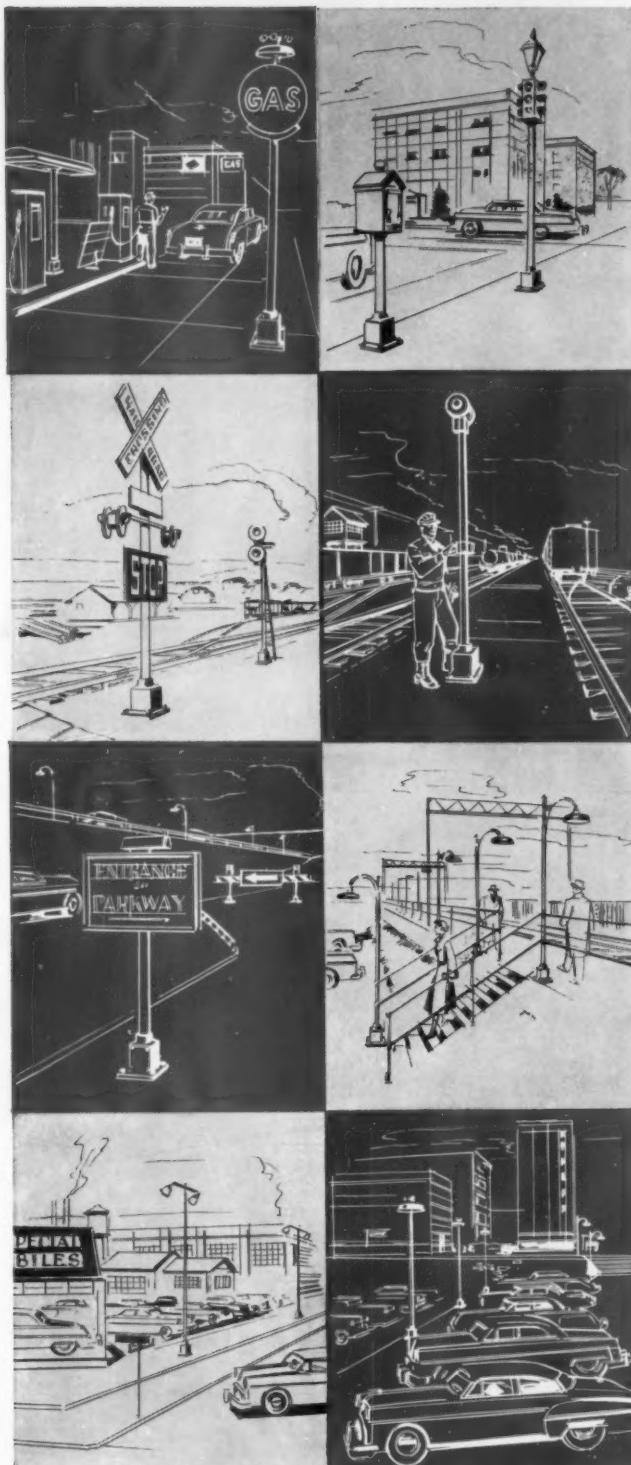
A Real Mechanic's
Tool — Lasts for Years

Rips outer sheath from non-metallic cable up to $\frac{1}{2}$ " O.D. Easier and faster—wire goes into cradle from side, no threading into cutters. Replaceable steel cutting blade is adjustable for various size cables. Frame is of aluminum.



Plan ahead with **GRAYBAR**

Handle these ... and other ... outdoor jobs*



with — A rigid support for cut-to-length pipe
A junction chamber for splicing and grounding

**COMBINED IN
THE NEW HOPE
METAL-PIPE BASE**

Here's the new, simple, low-cost way to supply custom-made uprights for outdoor lighting and other electrical applications. Start with Hope Metal-Pipe Bases. Use standard conduit or pressure pipe of the length and diameter needed. Cut and thread it to fit the rugged malleable iron base, and to take the lighting fixture. Buy base, pipe and fixture through your wholesaler—assemble them yourself—splice and ground in the junction chamber when you install. And the job is done!

For information on this flexible way of installing lighting (and other jobs) get in touch with your electrical wholesaler—or write us direct.

Hope Metal-Pipe Bases for 2", 2½", 3" and 4" pipe are available through your electrical wholesaler. Buy or specify by pipe size and catalog number, galvanized or unfinished.

2" - H 42200 3" - H 42300
2½" - H 42250 4" - H 42400



-CAST BOXES BY HOPE

JUNCTION AND PULL BOXES • TERMINAL BOXES
EXPLOSION HOUSINGS, CLASS I, GROUPS C & D
EXPLOSION HOUSINGS, CLASS II, GROUPS E, F, G
HINGED CABINETS • EXPLOSION GUTTERS

Write for complete catalog



HOPE ELECTRICAL PRODUCTS CO.
338 Wilson Avenue, Newark 5, N. J. Mitchell 2-4426

- **LIGHTING APPLICATIONS**—Parking lots, used car lots and gasoline stations
- Railway platforms, stairways, crossing and switching signals • Bridges lighting • Highway blinker lights and lighted signs • Traffic signals •
- **OTHER APPLICATIONS**—Police and fire boxes • Railroad yard loudspeakers

OTHER APPLICATIONS—Police and fire boxes • Railroad yard loudspeakers

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LITECONTROL'S CASE OF THE MISSING SHADOWS

Examine this courtroom carefully. Note the even illumination . . . the ease of seeing — designed to keep keen eyes and wits alert through tedious hours of legal battle.

Now, count the shadows! That's right. Not even one. Light but not bright, every point in this room offers maximum visibility — without harsh con-

trasts or tiring glare.

Secret here is standard LITECONTROL fixtures No. 5828 and No. 5838, slightly modified to arrange in rectangles. Better to look at, better to look

INSTALLATION: Boyle County Court House,
Danville, Kentucky.
AREA: County Court Room — Hon. Judge Cheek,
County Judge.

ARCHITECTS & ENGINEERS: Nevin & Morgan,
Louisville, Kentucky.

ELECTRICAL CONTRACTOR: Simpson Electric Co.,
Danville, Kentucky.

CEILING HEIGHT: 16 Feet, Approximately.
CEILING: Flat White.

WALLS: Light Green.
FLOOR: Brown Cork.

FIXTURES: Litecontrol No. 5828 2-lamp recessed
louvered troffers and No. 5838 3-lamp recessed
louvered troffers, using T1296 slimline lamps.

SPACING: 8' 6" on centers.

INTENSITY: Approximately 37 footcandles average
in service.

with, these beautiful fixtures also reduce maintenance to a minimum.

For light, looks, and low cost on your next lighting installation — make yours standard fixtures by LITECONTROL.



LITECONTROL Fixtures

KEEP UPKEEP DOWN

LITECONTROL CORPORATION, 36 Pleasant Street, Watertown 72, Massachusetts

DESIGNERS, ENGINEERS AND MANUFACTURERS OF FLUORESCENT LIGHTING EQUIPMENT DISTRIBUTED ONLY THROUGH ACCREDITED WHOLESALERS



Plan ahead with **GRAYBAR**

maintain an

"Air of Efficiency"

with



PROPELLER FANS

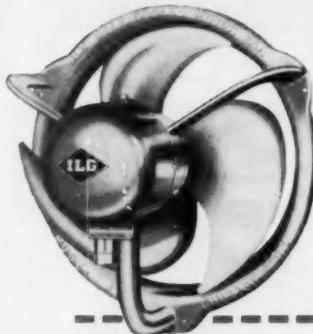
- faster air change • minimum maintenance
- lower power costs

Efficient operation calls for efficient ventilation... ILG ventilation! Equipped with self-cooled motors, Ilg Propeller Fans assure you longer, trouble-free, dependable performance. Rated and certified under standard testing codes, you can count on Ilg Fans to move more air. Dynamically balanced fan wheel, direct-connected to motor, assures smooth, quiet, free-running operation. And Ilg's famous "one-nameplate" guarantee covers both fan and Ilg-built motor as a unit.

You can choose an Ilg Fan from a complete range of sizes... 6" to 72". And you can expect fast delivery, too, because adequate stocks of Ilg Fans are maintained everywhere. You'll find experienced ventilating experts in all principal cities... ready and able to solve your air-moving problems. See your dealer, or write...

ILG ELECTRIC VENTILATING CO.

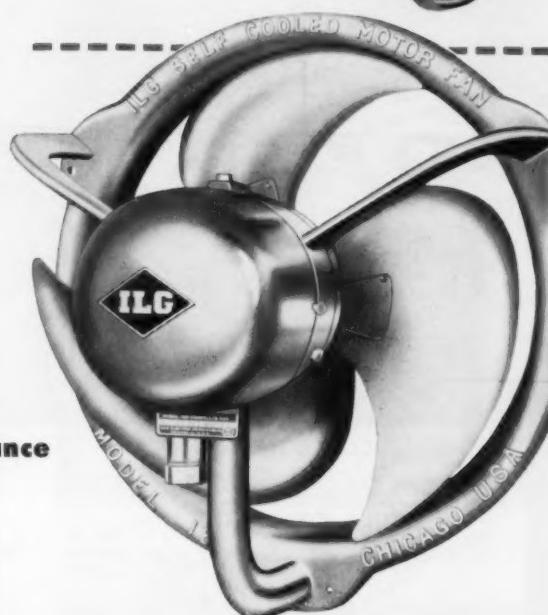
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TYPE "P"—high speed, maximum air volume within minimum dimensions. For use on systems up to .6" static pressure. Self-cooled motor. 4 sizes.



TYPE "W"—for large diameter wheels, 60" to 72" sizes. Dynamically balanced wheel. Rigid, sturdy frame. Self-cooled motor.



TYPE "Q"—powerful, quiet, efficient... plus long life, minimum maintenance. Self-cooled motor. 6" to 48" diameter wheels.



TYPE "X"—has TYPE "Q" wheel and ball bearing, explosion-proof motor. Non-ferrous frame. 16 capacities.

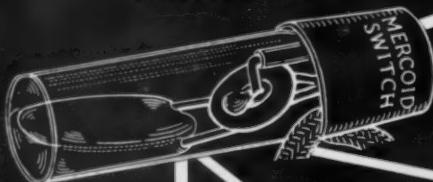
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MERCOID[®] CONTROLS

FOR PRESSURE, VACUUM, TEMPERATURE, LIQUID LEVEL

MERCOID
MERCURY SWITCH EQUIPPED
CONTROLS ARE AVAILABLE
FOR EVERY TYPE OF
SERVICE



MERCOID CONTROLS FEATURE
VISIBILITY OF "ON-OFF" CIRCUIT
VISIBLE CALIBRATED DIAL
OUTSIDE ADJUSTMENT—
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FOR GENERAL
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(Nema 1A, 2, 3, 4)



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FOR HAZARDOUS
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(Class 1, Group D.)
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A simple case of logic

Sherardizing

is Galvanizing
at its best



SO . . .

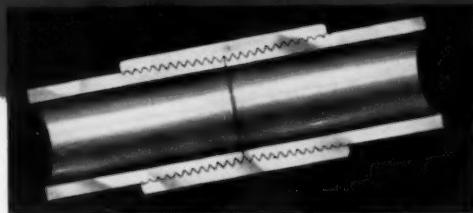
Sherarduct

is Galvanized Conduit
at its best

CHECK
THESE
FEATURES



1. THREADED BEFORE SHERARDIZING so that every clean, sharp thread has uniform full zinc protection.



2. THREAD PROTECTION . . . coupling threads and surfaces are fully zinc protected . . . Sherarduct coupling permits butting of conduit within the coupling.



3. Works easily . . . Fishes easily . . .
Bends without flaking.

EVERYTHING IN WIRING POINTS TO →

National Electric Products

PITTSBURGH, PA.

3 PLANTS • 8 WAREHOUSES • 34 SALES OFFICES



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Be on the SAFE side...

...insist on

EVEREADY
BRAND

You can count on dependable "Eveready" brand flashlights and batteries for long life, economy, safety, every time!



**Features of these new "Eveready"
Industrial-Type Flashlights:**

- Rugged insulated case (Ethyl Cellulose) will not shatter, crack or dent.
- Capable of standing severe abuse over a wide range of temperatures.
- Withstands deterioration from water, oils, greases, gasoline, alcohols and acids.
- Hand-replaceable insulated slide switch.
- Unbreakable safety-glow lens-guard protects lens from abuse and gives red safety-warning light.
- Streamlined to slip in and out of pocket without snagging.
- Ring hanger and sure-grip case.



**"Eveready" No. 1050
Industrial Flashlight
Battery**

Delivers twice the usable white light of any previous "Eveready" flashlight battery. Specially designed for heavy-duty use.



**"Eveready"
No. 950 Battery**

This leakproof battery gives you the ideal balance of long shelf-life and service-life for all applications, except extreme heavy-duty uses where the "Eveready" No. 1050 battery is recommended.

"Eveready" and "Nine Lives" with the Cat Symbol are registered trade-marks of Union Carbide and Carbon Corporation
NATIONAL CARBON COMPANY • A Division of Union Carbide and Carbon Corporation • 30 East 42nd Street, New York 17, N.Y.
Sales Offices: Atlanta, Chicago, Dallas, Kansas City, Los Angeles, New York, Pittsburgh, San Francisco. In Canada: Union Carbide Canada Limited, Toronto



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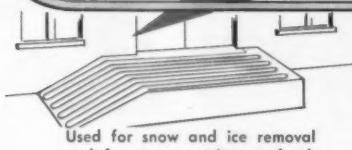
WHERE YOU NEED IT... WHEN YOU NEED IT!

**Here are a few of the
many heating jobs
being done by NELEX
MI HEATERS .**

NELEX MI CABLE HEATERS are making "hot" news because they enable you to apply heat precisely where it is needed . . . when it is needed.

These versatile, copper-sheathed, mineral-insulated heaters are designed to operate at temperatures up to 500° F. in open air. They are suitable for temperatures up to 1,000° F. when oxygen is excluded.

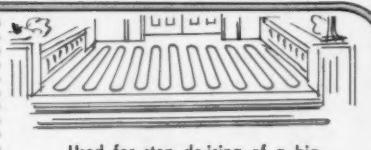
Nelex heaters have accurate thermostatic controls. They are low in first cost and require virtually no maintenance. These heaters are easily installed by any average electrician using standard tools and equipment.



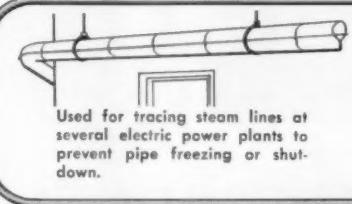
Used for snow and ice removal and freeze prevention on loading ramp of a mid-western utility company.



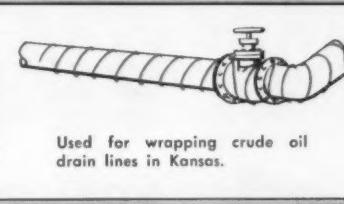
Used for freeze prevention on pedestrian ramp of large east coast refinery.



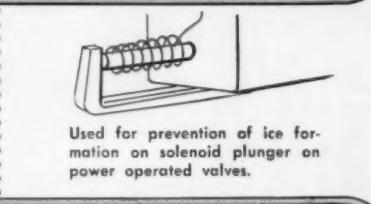
Used for step de-icing of a big cathedral in the mid-west.



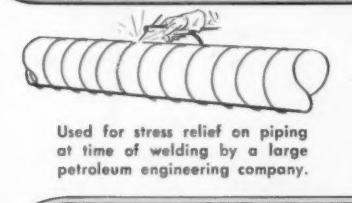
Used for tracing steam lines at several electric power plants to prevent pipe freezing or shutdown.



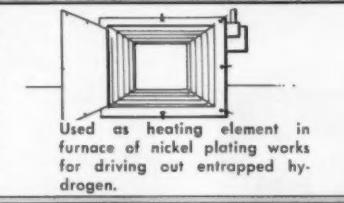
Used for wrapping crude oil drain lines in Kansas.



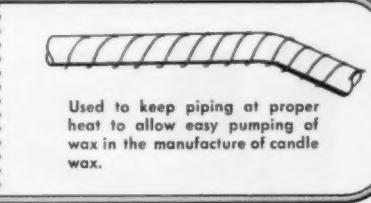
Used for prevention of ice formation on solenoid plunger on power operated valves.



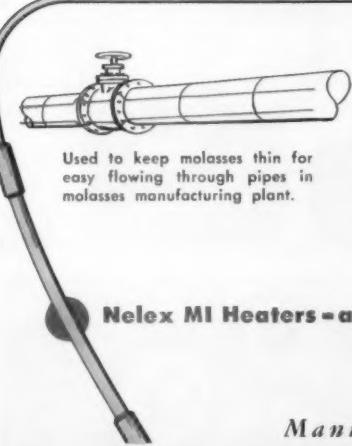
Used for stress relief on piping at time of welding by a large petroleum engineering company.



Used as heating element in furnace of nickel plating works for driving out entrapped hydrogen.



Used to keep piping at proper heat to allow easy pumping of wax in the manufacture of candle wax.



Used to keep molasses thin for easy flowing through pipes in molasses manufacturing plant.

NELEX MINERAL INSULATED (MI) HEATERS SOLVE MOST HEATING PROBLEMS FOR:

- De-Icing and Freeze Prevention**
- Heating and Melting Compounds**
- Surface Heating of Metals**
- Liquid Heating**

For more complete information on applications and performance characteristics, write for bulletin 1603, or submit your heating problem to Nelson's experienced engineers.

Nelex MI Heaters - a product of . . .

NELSON MANUFACTURING CO.
TULSA, OKLAHOMA

217 N. DETROIT AVE.

TELEPHONE 2-5131

Manufacturers of electrical equipment for Industry

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Another...



TIME and MONEY SAVING TOOL

FOUR-POINT KNOCKOUT PUNCHES

This four-point knockout punch is without doubt one of the most efficient tools of its kind on the market. It cuts cleaner . . . faster and with less physical effort . . . a typical NYE tool . . . built to last a lifetime.

- Four cutting points provide greater shear angle for easier cutting.
- Ball bearing chuck-in-hand-operated sets lessens strain on wrench and operator.
- Cuts clean burless holes, eliminating reaming edges.
- Metal slug easily removed—no prying or forcing necessary.
- Ideal for operating in close quarters.
- Nye punches are made of the highest grade steel and are engineered to do the best possible work.



IN 3 SETS - 10 SIZES

MODEL NO.	PIPE SIZE HOLE	STEEL THICKNESS
N1HS	1/2"-3/4"-1"-1 1/4"	5/32"
N2HS	1 1/2"-2"-2 1/2"	1/4"
N3HS	3"-3 1/2"-4"	1/4"

All sets packed in sturdy steel cases.

HAND OPERATED MODEL IN 4 SETS - 10 SIZES

MODEL NO.	PIPE SIZE HOLE	STEEL THICKNESS
N1/2MS*	1/2"	1/8"
N1MS	3/4"-1"-1 1/4"	5/32"
N2MS	1 1/2"-2"-2 1/2"	3/16"
N3MS	3"-3 1/2"-4"	3/16"

*Packed in zippered leather case. Other sizes in sturdy steel cases.



HYDRAULIC KNOCKOUT PUNCHES

The NYE Hydraulic Pump is adaptable to all types of Hydraulic Jacks, Ram Pullers and Benders. The Nye Hydraulic Ram likewise is adaptable to any Hydraulic Pump on the market. It is also equipped with a coupling, between the piston and the cutter, designed to prevent damage to either when pressure is initiated.

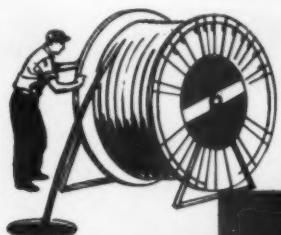


TOOL COMPANY

4122 Fullerton Avenue,
Chicago 39, Illinois



Plan ahead with **GRAYBAR**



SMOOTH BORE
NO SCORING OR
ABRASION OF SHEATH



EASY TO
INSTALL



EASY TO TOOL



CUTS WITH SAW

The Happy Combination

**Complete Protection...
Long Life...Low Cost**



ORANGEBURG
NOCRETE



COMPLETE LINE OF
INTERLOCKING PLASTIC SPACERS



WATER TIGHT JOINTS



ORANGEBURG
STANDARD

HOW does Orangeburg give cables complete protection? It's tough and strong. It's resilient, and "gives" without cracking or breaking. Its walls are impermeable. Its non-metallic material resists acids, alkalies, oil and salt in ground waters. Its joints are watertight. Its smooth bore reduces danger of abrasion.

WHY such low cost? Because Orangeburg is lightweight and easy to install; it lays faster than any other type of conduit . . . saves time and money. The long 8-foot lengths mean fewer joints to make. The Taper Sleeve Joints seal watertight with a few light taps. It lasts indefinitely . . . gives years and years of economical service.

Orangeburg is a leader in every city and state. For data about Fittings, Angle Couplings and Bend Sections, write Dept. EC-45.

ORANGEBURG MANUFACTURING COMPANY, INC.

• Orangeburg, N. Y.

• West Coast Plant, Newark, Calif.

ORANGEBURG®
FIBRE CONDUIT

STANDARD INSTALLED
WITH CONCRETE

NOCRETE INSTALLED
WITHOUT CONCRETE

Plan ahead with **GRAYBAR**



Whatever the job... PERMACEL TAPE



PLASTIC CUTTER BAR free with every 66' roll of Permacel 29 Plastic Tape. A non-conductor. Cuts easily and neatly.



COMPACT SPLICES. Permacel 29 stretches over twice its length—molds snugly to the work. Dielectric strength is 9,000 volts.



PERMACEL 29 and plastic cutter speed any insulating job. And Permacel 29 sticks tight, resists moisture, oil and abrasives.

SELF-STICKING **PERMACEL® TAPE**

Many jobs can be done faster, better, easier with self-sticking tape... write Permacel Tape Corporation, New Brunswick, N. J.

a Johnson-Johnson company



Plan ahead with **GRAYBAR**

**THERE'S AN
O.Z. BUSHING
FOR EVERY JOB**

TYPE "B"



Strongest insulating bushing available! Exclusive design permanently locks insulation into casting.

TYPE "BL"



Same as proven Type "B" with lug for quick, positive ground connections. Set screw in casting facilitates positioning.



Finest, high-strength, all-Bakelite insulating bushing. A top quality bushing—competitively priced!

All-Bakelite bushing with male thread for insulation of exposed cables passing through holes in metal boxes or troughs.

TYPE "A"



Over 35 years of specialized experience in the design and manufacture of conduit fittings is behind the complete line of O.Z. insulating bushings. Whatever your insulating bushing problem, you can be sure there is an O.Z. design to fit your application perfectly. Buy O.Z. bushings from your local electrical distributor.

TYPE "BB"

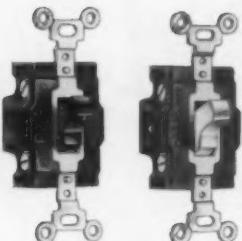
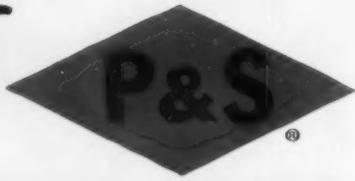


Representatives in all principal cities

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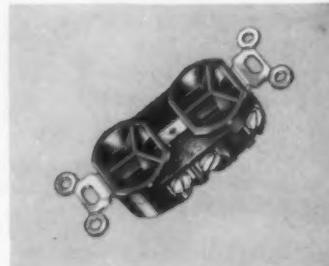


First for Quality



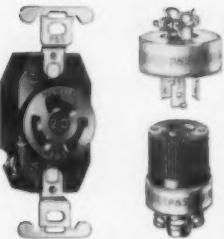
P&S SUPER A.C. SWITCHES

Designed for extra long life on HEAVY DUTY service. Rated 15 and 20 Amperes, 120 Volts A.C.-277 Volts A.C. Can be used at full rated capacity on fluorescent and incandescent loads—up to 277 Volts at 80% of current rating of switch on motor loads.



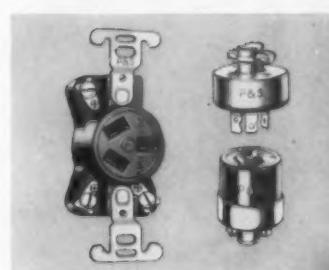
P&S 3-WIRE GROUNDING DEVICES

Complete line of connectors, receptacles and caps for grounding exposed metal parts of portable electrical equipment to meet Code requirements. Parallel slots and blades for 125 Volt circuits—Tandem slots and blades for 250 Volt circuits—U-shaped grounding slots. Sturdily constructed—Easy to wire.



P&S Turnlok Line

Sturdily constructed—Designed for quick, easy wiring—Ampere rating plainly visible on modern face design of receptacle. Connectors, receptacles and caps available in 10 and 20 Amperes—2, 3 and 4-wire types.



P&S POLARIZED DEVICES

Extra thick bodies and extra heavy metal parts will withstand rough usage over a long period of time. Designed for wiring ease. A complete line of 10 and 20 Ampere, 2, 3 and 4-wire connectors, receptacles and caps.

Send for P&S Catalog for complete information . . . and order by P&S Catalog number.

Department M

PASS & SEYMOUR, INC. SYRACUSE 9, NEW YORK

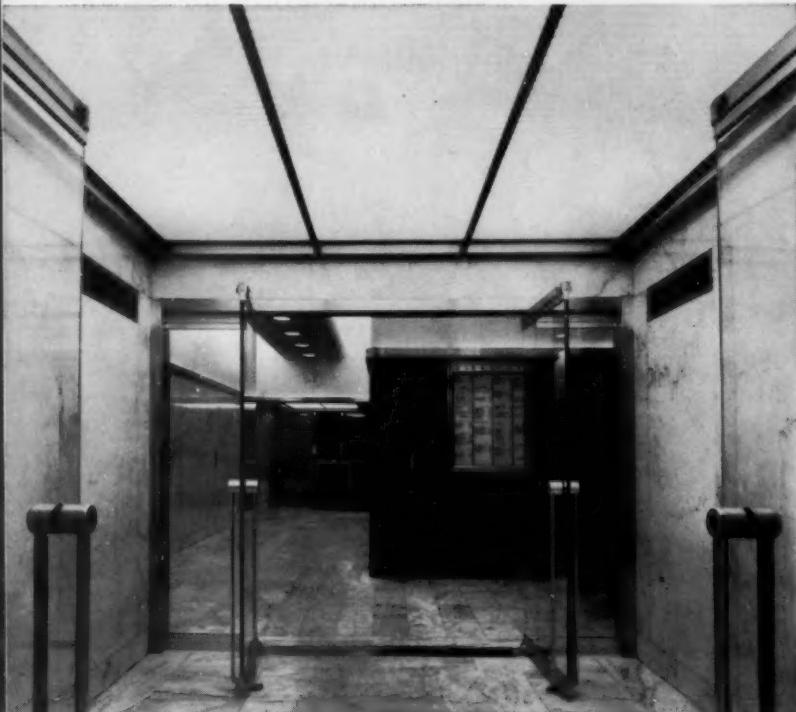
71 Murray St., New York 7, N. Y.
1229 W. Washington Blvd., Chicago 7, Ill.



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Other P&S Products: The original Despard Line® . . . P&S Surflex® . . . Roto-Glo® Switches . . . UNILINE® Wall Plates . . . ALABAX® Fixtures . . . Complete lines of Switches, Outlets and Lampholders.

ceilings
that
radiate
light



PITTSBURGH LUMA-CEILINGS

A NEW CONCEPT IN LIGHTING...

ADVANTAGES

TO THE OWNER

- Economical initial cost
- Diffused glare-free illumination
- Controllable light levels, if required



TO THE ARCHITECT

- Applications unlimited in new work or modernization
- Economical ceiling construction
- Obstruction-free ceiling plane



TO THE CONTRACTOR

- Easiest ceiling lighting system to install
- Underwriters' Laboratories listed
- A standard line, replacement parts are always available



The Luma-Ceiling is Pittsburgh Reflector Company's answer to the need for an all-purpose illumination source that is simple to install and easy to maintain. Light from Luma-Ceiling is soft and diffused with a quality similar to indirect lighting; no sharp shadows or contrasts are evident.

Pittsburgh's Luma-Ceilings have been used successfully in office buildings, laboratories, libraries, showrooms and a wide range of similar installations. Wherever they have been used, people who have worked with this type of lighting consider it the most ideal lighting medium yet devised.

The ceiling itself is a combination of translucent, corrugated, white vinyl plastic supported in extruded aluminum channels; the light source is either Pittsburgh Standard Fluorescent or Pittsburgh Slimline Strip.

See How Pittsburgh Luma-Ceilings can fit into your lighting picture. Bulletin 10 gives complete details; write for it.



PITTSBURGH REFLECTOR COMPANY

404 OLIVER BUILDING • PITTSBURGH 22, PA.

DISTRIBUTED BY ELECTRICAL WHOLESALERS EVERYWHERE • PERMAFLECTOR LIGHTING ENGINEERS IN PRINCIPAL CITIES

Plan ahead with **GRAYBAR**





*YOUR wire and
cable requirements
are PWC's business*

Sound basic engineering is a prerequisite to construction and maintenance of today's electrical installations. Whether it is power, control, electronic, machine, or circuit wiring, PWC has a wire, cable or cordset to meet your every need. PWC products cover every requirement of standard or custom cable manufacture. Consult with us on your engineering problems.

PLASTIC WIRE & CABLE CORPORATION

JEWETT CITY, CONN.

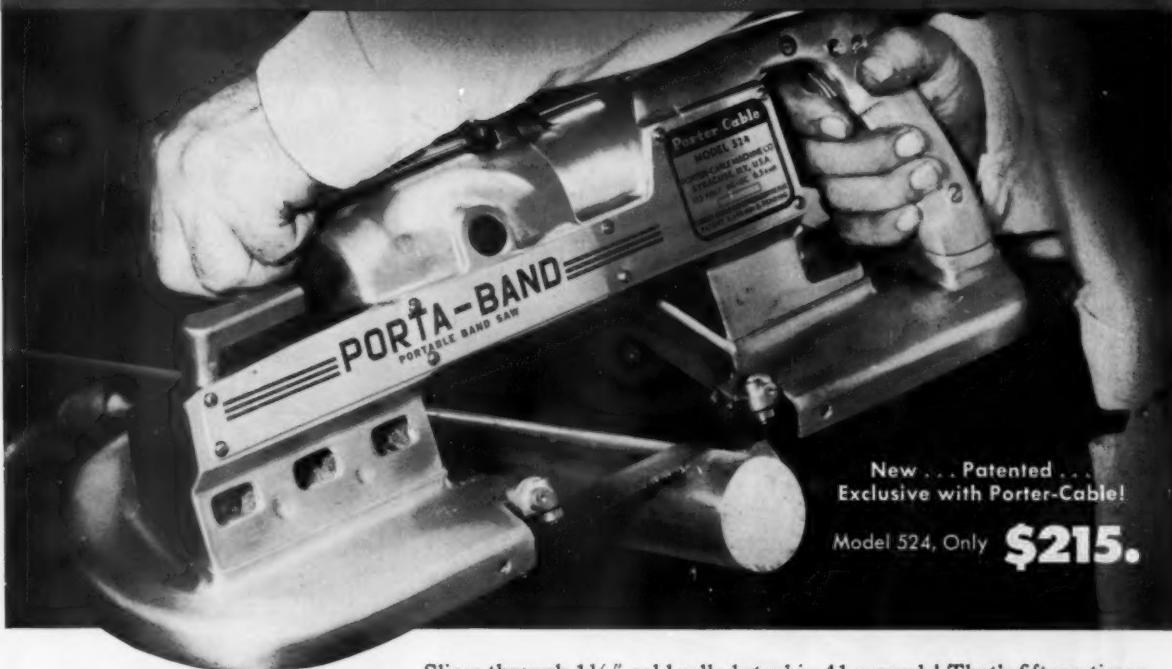


Plan ahead with **GRAYBAR**

New Porter-Cable Portable Band Saw

CUTS METAL 15 TIMES FASTER

than hand hack saw!



New...Patented...
Exclusive with Porter-Cable!

Model 524, Only **\$215.**

High or low . . . tight, awkward spots like this are easily accessible to the Porta-Band. Cuts operator fatigue, too!



On "Tailor-made" jobs, general maintenance, or tear-downs, Porta-Band does more work faster than any other tool.



Porta-Band cuts all types of cable up to $3\frac{1}{4}$ " diameter. Use powerful Porter-Cable generator when current is not available.

Slices through 1½" cold rolled steel in 41 seconds! That's fifteen times faster than a good man with a hack saw . . . *two-and-a-half times faster* than bulky power hack saws!

You can use this 16-pound work-demon anywhere — on ferrous or non-ferrous metals or "problem" materials. Take it into equipment yards, stock bins . . . tight spots where costly hand sawing is the only other answer. Compact, easy to handle, Porta-Band delivers smooth controlled sawing in any position. Only the cutting part of the blade is exposed. Cutting action pulls blade snugly into cut, holding saw firmly in place.

Powered for heavy duty . . . perfectly balanced . . . Porta-Band handles the toughest assignments. Band speed of 240 feet per minute insures swift, smooth cutting of all materials up to 3 $\frac{1}{4}$ " diameter round, or 3 $\frac{1}{4}$ " x 4 $\frac{1}{4}$ " rectangular. Highest grade precision ball and needle bearings throughout. Aluminum alloy frame for lightness, toughness. Universal 115V AC-DC, 25-60 cycle motor (230V available at extra cost).

Porter-Cable

Quality Electric Tools

**MAIL
COUPON
FOR
FREE
DETAILS**

PORTR-CABLE MACHINE CO.
5114 N. Salina St., Syracuse, N. Y.

(In Canada: Send to Strangridge, Ltd., London, Ont.)

Send

dealer.

Name _____

68

100

Type

Street

City

1

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Plan ahead with **GRAYBAR**



No. 4200
750 to 1500 W.
Enclosed Flood



Service-Lite
for Pits
and Viaducts



750 to 1500 W.
Gas Service Floods

Famous
Revere
Pylon-Lites



SERVICE STATION



SPORTS



AIRPORT



INDUSTRIAL



STORE FRONTS

Standardize on

Revere

ELECTRIC MFG. CO. CHICAGO, U.S.A.

**THE ONLY COMPLETE LINE
OF FLOODLIGHTS AND POLES
FOR ALL YOUR LIGHTING NEEDS**

Mercury or Incandescent Area Lights

Hand or Pilot House Control Searchlights

C-1 and C-2 Runway Marker

Single and Double Obstruction Lights

1, 2 or 3 Arm Poles for Gas Station Islands

Famous Revere Hinged Poles

Code Beacons and Flashers

Ultra-High Intensity Runway Marker

REVERE ELECTRIC MANUFACTURING CO.
6017 BROADWAY • CHICAGO 40, ILL.
Available in Canada thru Curtis Lighting Ltd., Leaside, Ont.



Plan ahead with **GRAYBAR**

a complete line to choose from . . .

Whatever your Time Switch requirements . . . there's a SANGAMO model to answer your needs!

Whether you need a high-quality, heavy duty time switch, a rugged, low-priced one, or a handsome, compact miniature time switch—Sangamo has a complete line of time switches for you to choose from.

Sangamo Heavy Duty Time Switch—Available with synchronous motor—or combined with an Automatic Carryover which assures continued operation for up to 10 hours in the event of a power failure. Or you can get it with an Astronomic Dial which controls the switching schedule in accordance with sunrise and sunset and also compensates for progressive changes in the seasons.

Unfailing on-off control . . . can take rough handling . . . doesn't need constant attention . . . 450 r. p. m., low-speed, maintenance-free, hysteresis motor . . . long-life silver contacts and bronze bearings at the points of greatest wear.



Low-Priced Type B



Rated at 30 amperes . . . install it and forget it . . . same low-speed motor as the heavy duty model . . . silver contacts . . . bronze bearings . . . easy to install . . . anyone can operate it . . . wiring room in one-half the case . . . $\frac{1}{2}$ " to $\frac{3}{4}$ " multiple knockouts.

ST34-5

"Precision in Miniature"
Type SR



Compact . . . single-throw . . . single-pole . . . 15 amperes rating . . . attractive . . . adaptable to switchbox mounting.

Interval-Type Timers

Ideal for attic, window and ventilating fans, unit heaters and air conditioning control . . . Type T for wired-in construction . . . Type TJ for portable convenience.



Only Sangamo Time Switches Have Famous Sangamo Quality . . . Give Famous Sangamo Performance!



SANGAMO ELECTRIC COMPANY

SPRINGFIELD, ILLINOIS

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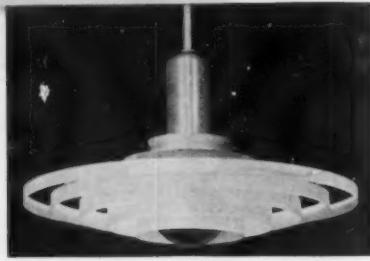


3500



5300

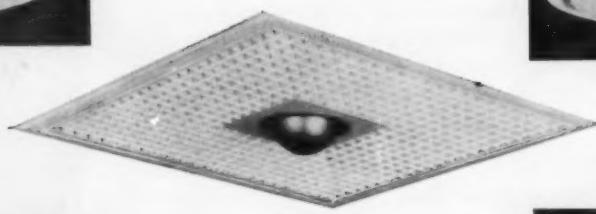
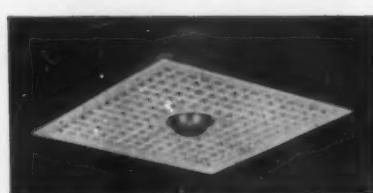
There's a
SKYLIKE®
SILVRAY
FIXTURE
for every
Lighting
Application



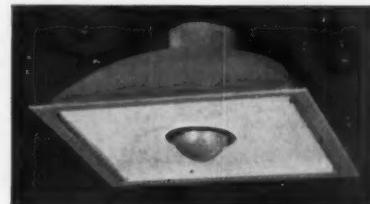
5500



5302

SKYLIKE
Louver Diffuser

JR. SKYLIKE • Louver Diffuser

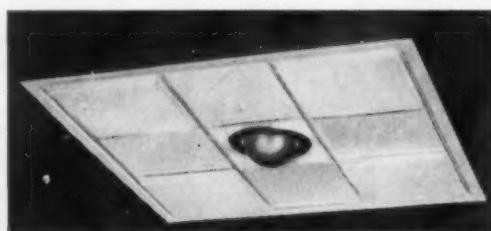


JR. SKYLIKE • Plastic Diffuser

Skylike-Silvray fixtures are engineer-designed to provide every requirement of efficient, economical lighting—plus appearance that harmonizes with, and becomes a part of, any architectural scheme. There are correct units for every application—Commercial, Industrial, Residential, Schools, Institutions, etc. See the Skylike-Silvray line before you make any decisions.



SILVER-DOT



SKYLIKE • Plastic Diffuser



SILVER-SPOT

Complete and factual data on any of the units illustrated is available on request. Just send a post card to...

OFFICE
RKO BUILDING
Radio City, N.Y.

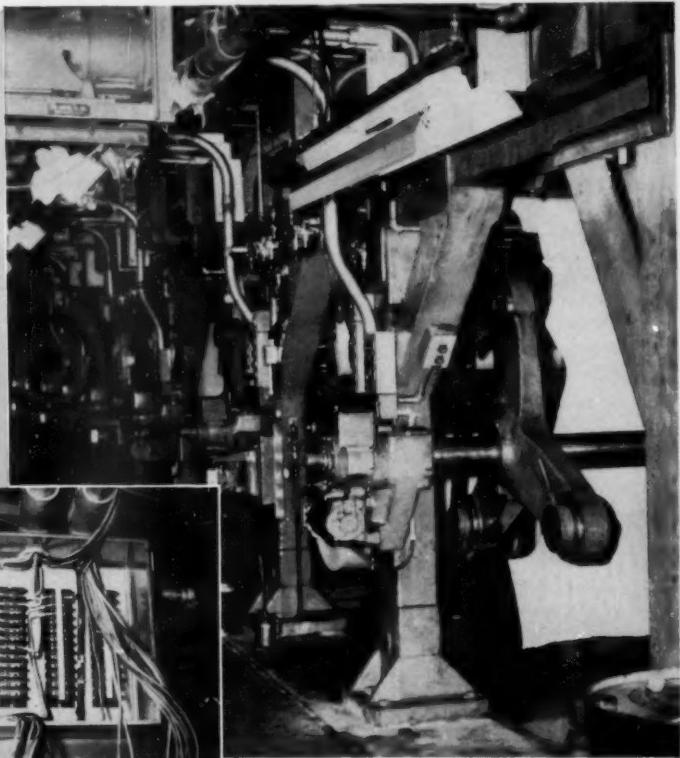
SKYLIKE LIGHTING, INC.
A SILVRAY ASSOCIATED COMPANY

FACTORY
BOUND BROOK
New Jersey



Plan ahead with **GRAYBAR**

Part of the "reel room" at a metropolitan newspaper. These units paste rolls of newsprint together semi-automatically at full press speed. Uninterrupted flow of paper lets three presses print 52,500 32-page newspapers per hour.



Terminal panel interior showing partially connected wires for pasting circuit. It's easy to identify Simplex-ANHYDROPRENE markings.

Photos courtesy of Detroit Free Press

This Metropolitan Newspaper Keeps Presses Rolling with Simplex-ANHYDROPRENE Wire

- A metropolitan newspaper has installed 250,000 feet of Simplex-ANHYDROPRENE Wires and Cables to connect motors and control stations.
- ANHYDROPRENE is easy to train and trunk in control panels.
- The neoprene jacket is tough and long enduring.
- It's a Simplex compound that is unequaled for balanced resistance to sunlight, oil, acids, excessive heat and flame.
- The Anhydrex insulation of ANHYDROPRENE Wires and Cables makes them resist water as no other insulation does.
- ANHYDROPRENE is suitable for use in conduits, underground ducts and exposed wiring indoors.
- It's especially recommended for wiring control circuits, underground primaries and factory systems.
- Write the address below for more details.

Simplex
ANHYDROPRENE

SIMPLEX WIRE & CABLE CO., 79 Sidney Street, Cambridge 39, Mass.

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QUALITY-CONTROLLED

SPANG[®] CONDUIT

... is easy to cut ... is easy to bend ... is easy to thread



... is easy to work with ... saves you installation time



... saves you money ... has high corrosion-resistance



... assures top-quality installations ... offers years of dependable service in any type of installation

Take your choice of SPANG Hot Dipped Galvanized, SPANG Black or SPANGLEAM EMT. They're all *top-quality* products.

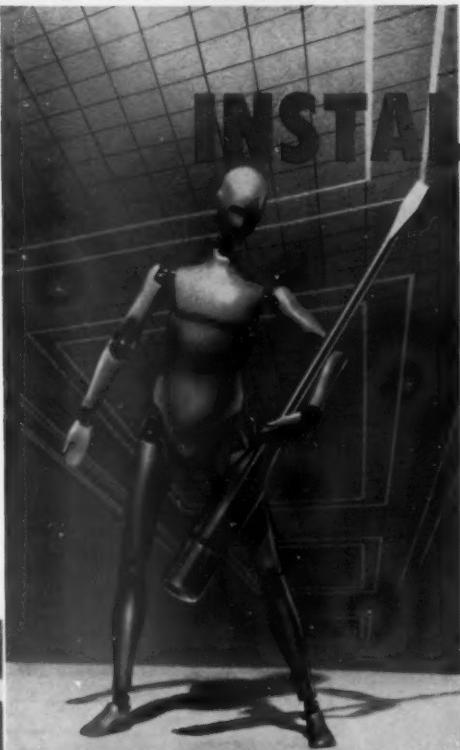
Your local SPANG Distributor carries the complete line of SPANG Conduit and fittings. He'll give you *top-quality* service, too.

Write for complete information and for the name of your nearest SPANG Distributor.



Plan ahead with GRAYBAR

NEW SMITHCRAFT TROFFERS FEATURE
**ROCK-BOTTOM
INSTALLATION COSTS!**



Only tool need is a screwdriver for final adjustment. No exact positioning required. Minimum number of parts and assembly on the job. Maximum simple adjustability at every critical point. Adaptable to most ceilings with a single, easy-to-install clip; provision for simple adaptability to all other ceilings. These new features save hours and dollars for you. And the Smithcraft Troffer installations you make mean more business for you. The new Smithcraft Troffer presents a clean, trim, uncluttered appearance because for the first time in the troffer lighting there are no visible catches, latches, bolts or screws. Perfectly straight, trim, in-line rows free from light leaks or blemishes. Here at last is a troffer that meets the contractor's every troffer need.



This mounting bracket with simple clip attachments adapts the Smithcraft Troffer to a great majority of the ceilings in use today.



The new Smithcraft troffer-in-plaster frame method assures perfectly square plastered openings and is unbelievably simple to install.

Write today for the new Smithcraft Troffer Book illustrating and describing the new Smithcraft Troffers in detail.



In louvered units, louvers hinge from either side and are removed without tools or loose parts.

Door frame containing glass, plastic or lens instantly opens or closes by simple pressure upwards.

Smithcraft

LIGHTING DIVISION
CHELSEA, MASSACHUSETTS

"BUY LIGHTING" — NOT FIXTURES — INVEST IN AMERICA'S FINEST FLUORESCENT LIGHTING

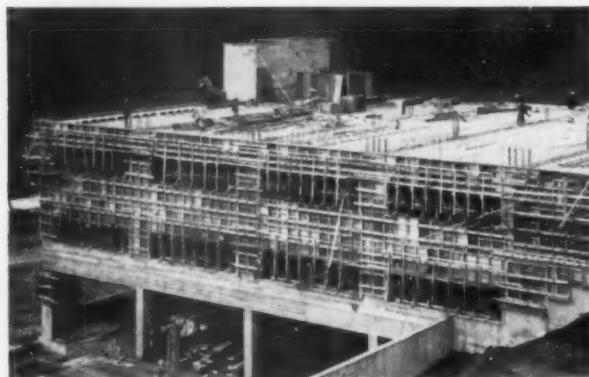
Plan ahead with **GRAYBAR**



Here's how Republic "Inch-Marked"[®] E.M.T.*



Republic "Inch-Marked" E.M.T. will be cast in the concrete on this pan-type construction job. It's approved by the National Electrical Code for concealed, exposed and concrete installations.



University of Oregon Dental School, Portland, Ore. Electrical Contractor: Ace Electric Co.; Architect: Lawrence Tucker & Wallman; Consulting Electrical Engineers: George Pettingell, Grant Kelly Co.; Electrical Wholesaler: Graybar Electric Co., all of Portland, Oregon.



pays dividends

It did on this job at the University of Oregon for the electrical contractor, Ace Electric Company, Portland, Oregon. Features of Republic "Inch-Marked" E.M.T. made installation easy. High quality and consistent uniformity of the tubing assured good fabrication and a dependable job.

The exclusive "Inch-Marked" feature of Republic E.M.T. eliminated wasted effort. Electricians didn't have to measure it. They cut the tubing at the "Inch-Marks". They were able to make smooth, accurate bends simply by lining up the "Inch-Marks" on the tubing with those on the Republic Calibrated Bender.

Inside-knurling, another exclusive feature of Republic E.M.T., simplified wire-pulling.

REPUBLIC

World's Widest Range of Standard



Plan ahead with **GRAYBAR**



in the long run

Everyone likes Republic E.M.T. because it makes work easier. There are fewer tools to carry around. No threads to cut. Republic E.M.T. is quickly joined using Underwriters' Laboratories' approved couplings and connectors.

And Republic E.M.T. is approved by the National Electrical Code for exposed, concealed and concrete installations. This is important on jobs like schools, hospitals, other institutions. Republic E.M.T. also carries the inspection seal of Underwriters' Laboratories and meets A.S.A. Specification C80.3.

Take advantage of these long-run dividends on your next job. Order Republic "Inch-Marked" E.M.T. from your distributor. Mail the coupon for additional information.

* E. M. T. means ELECTRICAL METALLIC TUBING.

STEEL

Steels and Steel Products



FOR VERY SEVERE CORROSION CONDITIONS Republic Dekoron-Coated E.M.T. is the answer. Its tough, polyethylene coating over the galvanized finish gives double protection to electrical raceways. Moisture-tight joints are easily made using threadless connectors and couplings. Joints are sealed with a tape. Dekoron-Coated E.M.T. provides an economical maintenance-free raceway that resists corrosion and reduces costs.

REPUBLIC STEEL CORPORATION

Steel and Tubes Division
212 East 131st Street
Cleveland 8, Ohio



Please send information on:

- Republic "Inch-Marked" E.M.T.
 Dekoron-Coated E.M.T.

Name _____ Title _____

Company _____

Address _____

City _____ Zone _____ State _____

K-S148

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EASIER TO
INSTALL AND MAINTAIN!



mount 1 device
instead of 2

extra-wide
gutters

all
components
accessible
from front

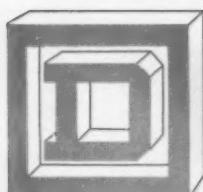
plenty of
knockouts

**SQUARE D
COMBINATION STARTERS**

(*Switch or Circuit Breaker Types*)

Save space and time. Mount and wire
one device instead of two...
neater, more attractive installations.

COMBINATION STARTERS and other Square D Products
are distributed by GRAYBAR



SQUARE D COMPANY



Plan ahead with **GRAYBAR**

**AUDIBLE SIGNAL
EFFICIENCY**
YOU CAN ACTUALLY

See!



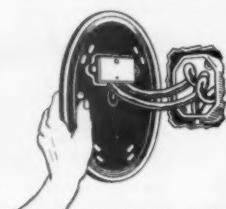
**SAFER, EASIER TO
INSTALL AND CHANGE**

One adapter plate fits horns, buzzers, bells or chimes . . . makes installation easy . . . when noise levels demand a new type signal. Safety too . . . Uni-Pact signals are built with electrically dead front adapter plate . . .

NO EXPOSED TERMINALS



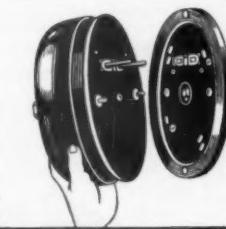
*Wire to Back of
Dead Front Adapter Plate*



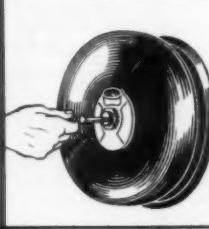
*Fits Standard Outlet Box,
Wiremold or Condulet*



*Secure Adapter Plate
to Box or Fitting*



*Plug Uni-Pact Signal
Into Adapter Plate*



*Tighten
Fastenings*



and Hear!

**LOUD ENOUGH FOR
EVERY INSTALLATION**

There's an *interchangeable* Uni-Pact bell, buzzer, horn or chime for *every* location—regardless of noise levels.

The Uni-Pact is an example of the advanced design features found in *every* Faraday product. See for yourself, whether you are interested in signals or a system for hospitals, schools, commercial or industrial applications.

When you build or modernize . . . install a signal system that offers everything . . . a system that has been designed, engineered and manufactured *entirely* by Faraday. Write for descriptive literature.

Sperti Faraday Inc.

ADRIAN, MICH.

Sperti Faraday of Canada, Ltd., Montreal, Quebec

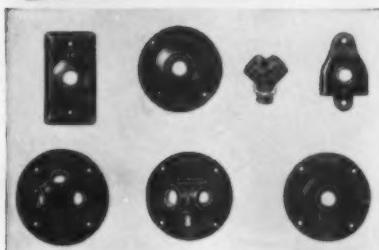
BUILDERS OF BETTER SIGNALS AND SYSTEMS... SINCE 1875

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FOR LIGHTING AT ITS ECONOMICAL BEST...

STEBER FLOODLIGHTS AND SEALED BEAM COMPONENTS



**CHROME PLATED STEBERLITES
WITH FITTINGS FINISHED IN RICH BLACK!**

Lustre—liveliness—sales appeal! Chrome plated Steberlites have it! The brilliant plated surface of the S-500, richly contrasted by deep black weather-proof lamp gasket and mounting flanges finished in colonial black, provides that magic touch which makes a Steberlite installation outstanding. S-500 Steberlites are fully adjustable, are factory wired and accommodate PAR-38 and R-40 medium base lamps. The mounting flanges provide for easy attachment to wall or pole, switch or outlet box—in single, two or three lamp combinations.

STEBER

**VAPORTITE
FIXTURES**



Especially designed for both indoor and outdoor use. Heavy cast aluminum construction resists moisture, salt spray, smoke, non-explosive dust, gas and most chemical fumes. Extra thick cork gaskets provided for perfect seal between splice box and fixture and glass globe and fixture cap. Types for mounting to outlet box or to vertical or horizontal $\frac{1}{2}$ " conduit or pipe. Each unit can be furnished with welded wire guard to protect globe from breakage. Uses 100 or 200 watt lamp.

STEBER

**ALUMINUM HIGH BAY
LIGHTING UNITS**



HB-1 with
HB-2
Shield

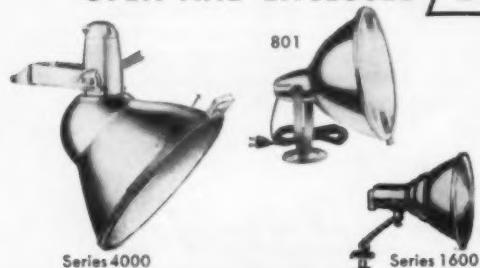


HB-1 uses reflector flood lamps R-52, 500-750 watts; R-57, 550-800 watts; and 400-watt mercury vapor lamps H 400-R1, H 400-RC 1, K-H 1, and L-H1. Mount 20 feet or more high. Shield protects globe from falling moisture.

Steber high bay reflectors can be mounted singly or as twin units to permit combination of mercury vapor and incandescent lighting to approximate daylight. Available for 300-500 watt incandescent lamps or 250 watt mercury vapor lamps, and 750-1500 watt incandescent or 400 watt mercury vapor lamps.

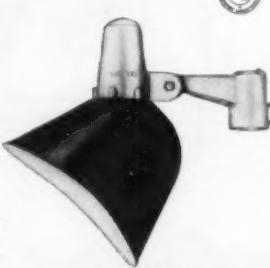
OPEN AND ENCLOSED

STEBER FLOODLIGHTS



Economical Steber floodlights are available in both open and enclosed types for lamps from 100 to 1500 watts. Each unit has ample wiring compartment (or is fully wired with cord and plug), and versatile mounting bracket for quick, easy installation. Ideal for all industrial, commercial and sports areas—wherever high level illumination is required.

New Steber Catalog TDS-9 gives complete details of units shown here and many other Steber items. Write for your copy now.



Steber-Woodhouse Ltd.
2368 Dundas St. West
Toronto, Canada

STEBER

STEBER MANUFACTURING CO. Steber Manufacturing Co. of California
Dept. 98, Broadview
(Maywood P.O.), Illinois

242 So. Anderson St.
Los Angeles 33, California



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Approved by
Underwriters'
Laboratories, Inc.

2 great
new designs
for
fluorescent
lighting
support

by

KINDORF

SIMPLEX SYSTEM

* SURFACE RACEWAY SYSTEM

Specially designed for use as a combination surface raceway and flush-mounting fluorescent fixture support. Completely enclosed from outlet box to fixture to eliminate the clutter of external conductors, this system also protects the wiring from physical damage. Its simple "slot-up" design makes it easy to install . . . easy to wire.

A fluorescent fixture *support* system only, its channel is applied slot-side down, and is not intended for use as a raceway. This system combines economy of investment with maximum strength and rigidity. It is easy to install and fixtures may be attached, or relocated, without lowering, or otherwise disturbing the basic channel assembly.

designed by electrical engineers
made by a leading electrical manufacturer
for the electrical trade.



Write for our
product bulletin g-1.
"Fluorescent Lighting
Supports by Kindorf."

a product of

**STEEL CITY
ELECTRIC COMPANY**

PITTSBURGH 33, PA.

Plan ahead with **GRAYBAR**



AMAZON TAPE



Amazon A.S.T.M. tapes are designed for the severest kind of service — where top quality is of prime importance.



AMAZON FRICTION TAPE is of unusually high and uniform quality. Meets Government Specification HH-T-101 Grade A. The long fibers of the rubber compound used afford superior adhesion and make the tape an excellent insulator.

- **AMAZON RUBBER TAPE** withstands a dielectric test of at least 350 volts per mil of thickness . . .
 - meets Government Specification JJ-T-11C. The very high natural rubber content of this tape makes it extremely elastic and it is self-vulcanizing into a solid waterproof joint.

There's a Graybar tape FOR EVERY JOB

Tapes for every electrical requirement are conveniently available from your nearby Graybar office or warehouse. Made to rigid Graybar specifications these fine tapes have a record of superior performance, long service.

and outstanding value. For forty years they have been the choice of industry and careful workers everywhere. Check the types shown on this page and see which are best suited to your own particular needs.

VICTOR TAPE



**for general commercial use
requiring a high grade tape**

VICTOR FRICTION TAPE has a strong tacky friction, ages well and is virtually free from pinholes. Careful inspection assures a uniform quality.



VICTOR RUBBER TAPE is second in quality only to Amazon. It withstands dielectric test of 300 volts per mil of thickness — gives excellent service both indoors and out.

STICKA FRICTION TAPE



STICKA will be your choice for a hundred and one everyday jobs where a thoroughly reliable and economical tape is indicated. Order it by the 60 foot roll or in the convenient ten-roll shop package.

515-41

DEPEND ON ALL **Graybar** TAPES FOR THE BEST IN SERVICE AND VALUE.



Plan ahead with GRAYBAR

YOU'LL WORK

FASTER • BETTER • Easier • SAFER

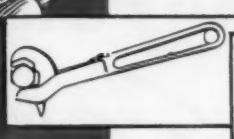
WITH

TEC

IMPORTS

STICKLEBACK

TOOLS

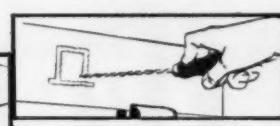
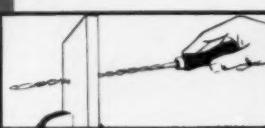
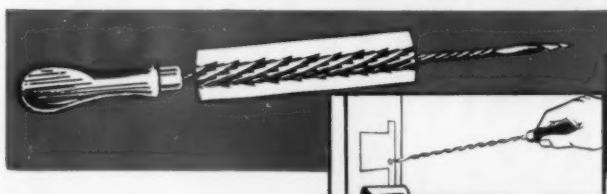


ONE HANDER RATCHETING WRENCH

The revolutionary new wrench that automatically gives a perfect three-point grip for pipes or nuts.

Priced from \$1.75 to \$11.95, sizes 6"-8"-10"-12"-15"-20"

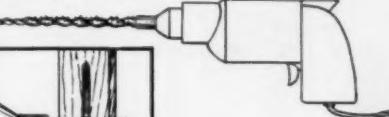
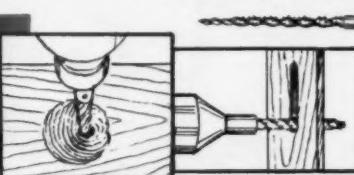
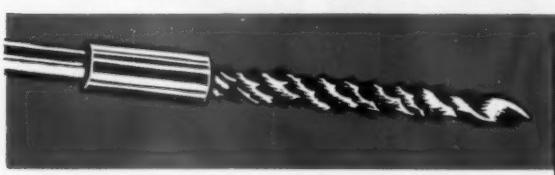
Allows adjustment while wearing safety gloves



STICKLEBACK DRILSAW

Any shape hole with one tool that both drills and saws in any direction. No. 1 to 4 from \$1.60 to \$2.95. No. 5 Saw Rasp \$1.98

Ideal for piercing outlets

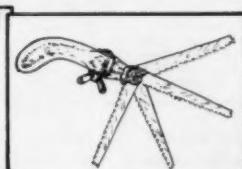
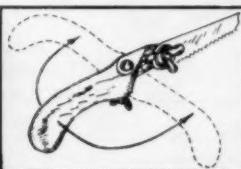


STICKLEBACK DRILL ROUTER

The only tool that drills, enlarges and routes using any conventional $\frac{1}{4}$ " power drill.

Two sizes — #318-1, $\frac{1}{4}$ " dia., $2\frac{3}{8}$ " long, \$1.25; #318-2, $\frac{1}{4}$ " dia., $4\frac{1}{2}$ " long, \$1.40

Perfect for bell and relay installation



Makes any shape hole in floors, walls, panels, etc.

STICKLEBACK DRILSAW NESTS

The Universal set that both drills and saws. #1002, two different saws, \$2.95 — #1004, 4 different saws, \$3.95

ASK FOR COMPLETE ILLUSTRATED CATALOGUE OF ALL STICKLEBACK TOOLS

TEC IMPORTS, 14525 BESSEMER ST., VAN NUYS, CALIF.

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YES! SEND A "BOY"
TO DO A MAN'S JOB!

Pull Any Size Pole Easier



CABLE REEL JACKS
Double-acting and single-acting ratchet lever types or screw type. One to 10-ton capacities. Field model available soon with light-weight aluminum housing.



AERIAL CABLE AND WIRE TENSIONING JACK

Capacity 2 tons.

MANHOLE SHEAVE
Handles up to 3-inches diameter cable or any size winch line.

JUNIOR POLE JACK NO. 325
Pulls or straightens poles up to 30 feet high. 5-ton capacity.

Here's the first time-and labor-saving improvement in pole jacking in 25 years! New aluminum housing on The Simplex heavy-duty Pole Jack eliminates 35 pounds of weight, without sacrificing a pound of lifting capacity. You can pull or straighten poles, pull butts or move loaded poles without interruption to service—and without digging. Only 60 pounds in weight, it's easy to move from job to job; saves time and work.

This new Simplex No. A-1538 Aluminum Pole Jack has the better-performance and long-lasting construction features that made its predecessor—the famous Simplex No. 329 with malleable housing—the standard Pole Jack of the Bell Systems. The husky "I" beam base gives a firm foundation; jack pivots on the base when pawl is disengaged. The A-1538 has 15-ton capacity and 22-inch lift. Comes completely equipped with steel chain and lever bar.

Get full information now from your Graybar Branch,
or write for Catalog No. 55



TEMPLETON, KENLY & COMPANY

2551 Gardner Road, Broadview, Illinois



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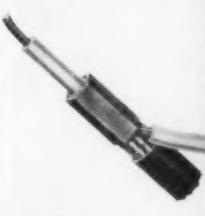
for Liquid-Tight Flexible Metal Conduit... A snap to install. No need to disassemble these new T & B Connectors. Blue plastic gripping ring gives visual assurance of a tight, leakproof connection... seals out all moisture, oil, corrosive fluids. Straight connectors, 45° and 90° elbows available for $\frac{3}{8}$ " to 2" liquid-tight flexible metal conduit.

for Standard Rigid Conduit... Made of shatterproof cellulose acetate butyrate, new T & B Insulating Bushings are the toughest available. Meet NEC requirements for protecting cable sheath or wire insulation against damage from burred or unevenly cut conduit. Bright blue for easy identification. Sizes from $\frac{1}{2}$ " to 6".



for Service Entrance Cable... Color-coded Neoprene bushings and push-out paper discs give at-a-glance size identification on new T & B Watertight Service Entrance Cable Connectors. Unaffected by water, oil, sun, or chemicals. Hex-gland and two-screw types available... each size accommodates a wide range of cable diameters.

for Mineral-Insulated Cable... Ground and terminate M. I. cable with these new T & B connectors. Neoprene bushings seal out all moisture. Washer-type brass ring assures a grounding path from the raceway to the fitting's metallic body. Only eight connectors fit all M. I. cable diameters from .309 to .730 inches.



for Shielded or Casual Wires and Cables... Color-coded, compression-type T & B Grounding Sheath Connectors assure positive contact between braid and ground lead — without soldering! Color-coding gives at-a-glance size identification... installing tool, color-coded to match, assures proper compression for each fitting. For .058" to .297" conductors.



FITTINGS FOR BETTER WIRING

For engineering data, just write to
The Thomas & Betts Co. at the address below.



LOOK FOR THIS SIGN —

IT'S THE MARK OF AN AUTHORIZED T & B DISTRIBUTOR

The complete line of T & B fittings for conductors and raceways is sold only by recognized electrical wholesalers. It's our way of assuring you the service and savings of a friendly local source. Call him for all your electrical needs.

T46

THE THOMAS & BETTS CO.
INCORPORATED

34 Butler Street • Elizabeth 1, New Jersey

Thomas & Betts Ltd., Montreal, P.Q., Canada

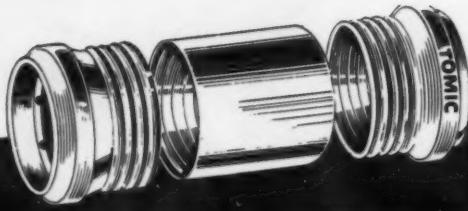
MANUFACTURERS OF FINE ELECTRICAL FITTINGS SINCE 1898

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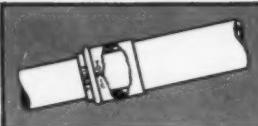
FACT'S

PROVE TOMIC MOST VERSATILE THINWALL COUPLING OF THEM ALL!



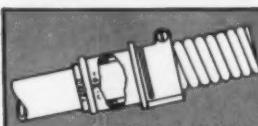
Pat. No. 2458276

IT'S A FACT—



with TOMIC you can go from heavy pipe to Thinwall and vice versa without special fittings. Ideal for alteration work and additions.

IT'S A FACT—



with TOMIC you can go from Thinwall to Greenfield or ANY type cable. Ideal for heating installations and factory maintenance.

IT'S A FACT—



with TOMIC, all connections screw together. Will never shake loose.

IT'S A FACT—



with TOMIC, you can snap tubing into couplings in corners or close quarters.

COUPLINGS

No. 310— $\frac{1}{2}$ " • No. 311— $\frac{3}{4}$ "
No. 312—1"



Do the Job Better!

WITH TOMIC THINWALL CONNECTORS!

NO CRIMP! NO SCREW! NO WRENCH!
JUST TAP OR PUSH IT ON!

Pre-flexed stainless steel lock washer slips on tube with the greatest of ease—makes uniform, safe, permanent vibration-proof 6-point ground around entire tube. OK in concrete slabs. Perfect for cramped or corner locations. No. 10— $\frac{1}{2}$ ", No. 11— $\frac{3}{4}$ ", No. 12—1"



Pat. No.
2458276

TOMIC SALES & ENGINEERING CO.

Detroit, Michigan



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*For Fast, Low-Cost
Production, Repair
and Maintenance
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**DEPENDABLE
POWER**



Thor
ELECTRIC
IMPACT WRENCHES

Basically designed for amazing power and speed in setting and removing nuts, these versatile machines can also be used for drilling, tapping, hole-sawing, extracting screws, driving studs, etc.

Thor Power Tool Company, Aurora, Illinois.

THOR IMPACT WRENCHES

No. 55 SPEEDWRENCH, $\frac{3}{8}$ " Capacity, finger-tip push-button reverse.

Price \$89.50

No. EW6 Silver Line, $\frac{3}{8}$ " Capacity.

Price \$130.00

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Price \$195.00

COMPLETE LINE OF KITS

Thor PORTABLE POWER
TOOLS



TRIMENDOUS SAVINGS when Thor electric impact wrenches replace hand methods of obsolete tools. Demonstrations arranged without obligation.



CONVENTIONAL THOR electric screwdrivers and nut setters are also available where required for assembly line applications.



VERSATILE USE—Thor impact wrenches are adaptable for screw-driving, drilling, tapping, hole-sawing or anything else you need.



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SCREWDRIVERS—NUT SETTERS—GRINDERS—NIBBLERS
AUTOMOTIVE VALVE SHOP TOOLS—SANDERS—POLISHERS



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IT'S TRIANGLE

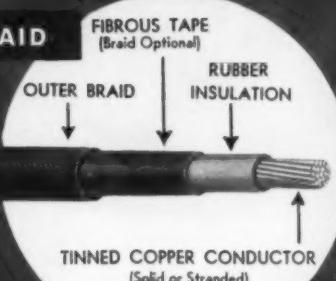
For Rugged, High Quality Power Cables— *All the Way Through!*

Don't judge a power cable by its cover alone. If you want reliability in high voltage cables, check the complete construction of Triangle Power

Cables. You'll find that every protective layer is made of quality materials that give you extra protection, extra benefits.

TAPE AND BRAID

(Meets I.P.C.E.A. Standards
Listed by Underwriters' Laboratories, Inc.)

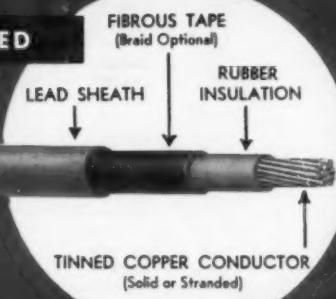


The braid covering on this Power Cable is made from high quality, long staple cotton or glass filament "GLAZON" braid or a combination of both, depending on the size. underneath this tough braid is a layer of fibrous tape which is substantially as thick as the outer braid itself. This tape is a strong fabric, thoroughly impregnated with a rubber compound.

The insulation on these two cables is Triangle's famous "Adipon" (Type AD-100) insulation. This insulation is a high grade rubber, expertly vulcanized. Repeated tests prove that this insulation is far superior to normal insulation in its moisture resistance, heat resistance and long life. It is approved by Underwriters' for service either in wet locations at 60°C or dry locations at 75°C and exceeds Underwriters' specifications for either RH or RW.

LEAD COVERED

(Meets I.P.C.E.A. Standards
Listed by Underwriters' Laboratories, Inc.)



Where excessive moisture is expected to be encountered, specify Triangle Power Cable with the lead sheath. It affords extra protection against moisture, corrosion and mechanical damage.

OZONE RESISTANT

(Meets I.P.C.E.A. Standards
Listed by Underwriters' Laboratories, Inc.)

Here's the absolute top in Power Cables. Where high voltages raise the possibility of destructive ozone, Triangle's "Tri ozone" cable is the answer.

Tri ozone insulation is a butyl-rubber base insulation that defies ozone and protects the outer neoprene cover.

In many cases a semi-conducting tape is applied over the stranded conductor for further protection.

A tough fabric tape is applied over the ozone-resistant insulation. When required, a tinned copper shield is applied. On top of this is more tape. Then—a special neoprene jacket that is resistant to oil, heat, sunlight, flame and corrosive chemicals.

OTHER POWER CABLES produced at Triangle include — Control Cable — V. C. Interlocked Armor Cable — Parkway Cable — Varnished Cambric — and many others.

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NEW BRUNSWICK, N. J.

Manufacturers of Arteries for Electricity, Liquids and Gases

WIRE • CABLE • CONDUIT • PLASTIC PIPE • BRASS AND COPPER TUBE

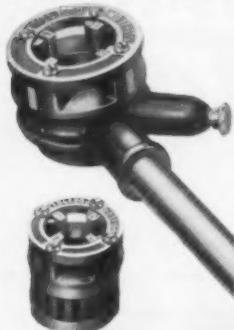


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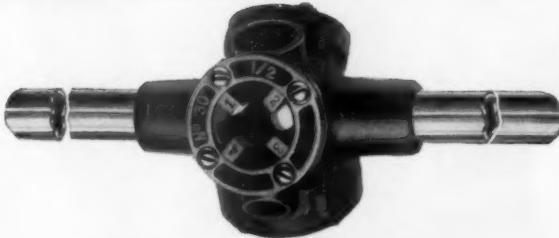
SMO-O-O-TH PERIOD
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 TRADE-MARK

 REGISTERED
 U.S. PAT. OFFICE
PIPE TOOLS
 zip through jobs of conduit
 threading with amazing ease
 . . . reduce your costs!

SMALL RATCHET CONDUIT THREADERS



Toledo Small Ratchet Threaders produce clean-cut, perfect threads in difficult corner jobs. Operate easily. Instant change of dies. No. 00 threads $\frac{1}{8}$ to $\frac{3}{4}$ inch; No. 11 threads $\frac{1}{8}$ to $1\frac{1}{4}$ inch; No. 12 threads $\frac{1}{2}$ to 2 inch conduit.



3-WAY CONDUIT THREADERS

No. 30 weighs $4\frac{3}{4}$ lbs. NET. No. 31 weighs 7 lbs. NET. Dies easily removed and reground when dull or replaced at slight cost. No adjustments, no loose parts, ample chip clearance.

No. 30— $\frac{3}{8}$ " to $\frac{3}{4}$ ". No. 31— $1\frac{1}{2}$ " to 1".



HEAVY DUTY CONDUIT CUTTER

Sets the pace for ease and speed in $\frac{1}{8}$ " to 2" cut-offs. You can see the cut-off mark. Straight-line pressure on cutting wheel. Tracks perfectly. Hooks on pipe easily . . . sturdy malleable frame formed to fit the hand and guaranteed warp-proof. Rollers in hook provide true alignment, assuring square cut-off.



**TOLEDO 88
POWER DRIVE**

Converts hand tools to power—saves time and muscle for operating hand conduit threaders, cutters and reamers. Light weight . . . aluminum housing . . . easy to carry about. Powerful . . . efficient . . .

rugged. New Toledo 3-jaw scroll chuck on front with 6 pinions for greater convenience; rear chuck, universal centering. Universal motor, $\frac{1}{2}$ H.P. forward and reverse, 25 to 60 cycles, AC or DC, any 110 volt outlet. Capacity— $\frac{1}{8}$ " to 2" conduit, $\frac{1}{4}$ " to $1\frac{1}{2}$ " bolts; with universal drive shaft, geared die stocks and cutters up to 12".

No. 999—2"
Heavy Duty
Power Conduit
Machine

Toledo No. 999 cuts, threads and reams $\frac{1}{2}$ to 2" conduit. A rugged, compact, portable power conduit machine. Ball bearing Universal motor, $\frac{1}{2}$ hp., operates from any 115-volt lamp socket. Powerful, no gear shifting levers. Choice of wheel or knife cut-off on super model. 2-in. pipe is cut off in 10 seconds, smaller sizes relatively fast.

No. 999—Standard model $\frac{1}{2}$ to 2 in. non-opening Die Heads.

No. 999—Super model $\frac{1}{2}$ to 2 in. quick opening Die Heads.



CONDUIT VISE and STAND

New Toledo No. 1 Vise has exclusive rocking-wedge action jaws. Positive grip holds any shape without crushing. Wedge action of jaws tends to eliminate marking of conduit. Heat treated jaws. Capacity $\frac{1}{8}$ " to $2\frac{1}{2}$ ".

New handy Toledo No. 8 Vise Stand makes a sturdy lightweight work-bench. Built-in tray folds for easy carrying. Sets up or takes down quickly. All one unit, no loose parts. Large size vise base for easy mounting of Toledo or other vises. 3 conduit benders, plenty of tool slots, conduit rest, ceiling brace. A perfect tool!

The Toledo Pipe Threading Machine Co.
 TOLEDO, OHIO

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New
 PROTECTION IN WIRE PULLING
RED THROAT
 INDENTER No. BM 21 B
CONNECTOR FOR EMT



**RED
PLASTIC
Bushing
GREATLY
INCREASES
SAFETY
and
ECONOMY**

NO INCREASE IN PRICE

"BM" Connectors—Original Indenter Type

Cat. No.	Size	Pounds Per 100	Carton Quantity	Standard Package
BM-21B	1/2"	7	50	500
<hr/>				
	Net Price per 100			
Less Carton	Carton Quantity		Standard Package	
\$ 9.40	\$ 8.55		\$ 7.80	

- Wagner BM Fittings are approved by Underwriters' Laboratories as concrete tight and comply with Federal Specifications W-F-406.



WAGNER MALLEABLE PRODUCTS CO.

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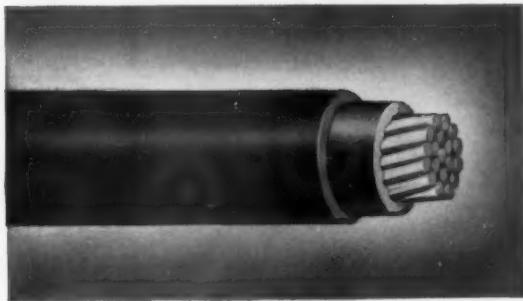
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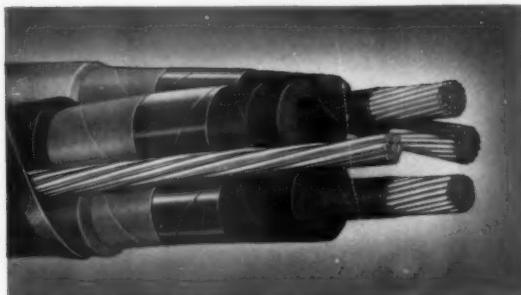
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10 reasons why you should specify, buy, install U. S. GRIZZLY® POWER CABLES



U. S. Grizzly Power Cable, 600 volts—Type RR
single conductor, Hydrosec®—S heat- and moisture-
resistant insulation, Neoprene jacket.



U. S. Grizzly Power Cable, 5,000 volts—Type RR
—3-conductor, Uskorona®—ozone-resistant insula-
tion—shielded—Neoprene jacket.

1. Lighter in weight than lead-sheathed cables and lead-sheathed armored cables.
2. Greater flexibility
3. Easier to handle during installation
4. Easier to splice, tap and terminate
5. More resistant to chemical corrosion
6. Unaffected by stray currents
7. Better protection against weathering
8. Longer life
9. Cost less
10. Made by United States Rubber Company, the *only* electrical wire and cable producer to grow its own natural rubber, make its own synthetic rubber and manufacture its own plastics

U. S. Grizzly Power Cables are used for general power distribution, and can be installed in conduits, underground ducts, buried directly in the ground, or installed aerially. Neoprene jacket protects against acids, alkalies, oils, and mechanical damage and weathering. (All IPCEA and NEMA specifications complied with.)

Write to address below for
free catalog, U. S. Electrical
Wires and Cables.



UNITED STATES RUBBER COMPANY
ELECTRICAL WIRE AND CABLE DEPARTMENT, ROCKEFELLER CENTER, NEW YORK 20, N. Y.

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Portable d-c and a-c thermo instruments for precision measurement of potentials and minute currents in electronics or laboratory research.

Specialized and Multi-purpose

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For complex, or just routine measurement jobs, these and other specialized WESTON Instruments save time and assure dependable measurements. For information on the complete line, see your local Weston representative, or write . . . WESTON Electrical Instrument Corp., 614 Frelinghuysen Ave., Newark 5, N. J.

WESTON

Instruments



Industrial Circuit Tester—Model 785

A multi-range, multi-purpose, ultra-sensitive analyzer, for laboratory and industrial checking of electrical and electronic circuits. Has 28 practical scale ranges; measures d-c and a-c voltage, d-c and a-c current, and resistance. Accessories available to extend ranges. Compact and portable; furnished in either oak or steel case.



**Model 901
Portable Test Instruments**

Available in d-c, Model 901—and a-c, Model 904, single and multiple ranges of wide coverage. Excellent scale readability and shielding. Accuracy within $\frac{1}{2}$ of 1%.



A-C Clamp Volt-Ammeter

(Model 633, Type VA-1) For convenient and rapid measurement of a-c voltage and current without breaking the circuit. Jaws take insulated or non-insulated conductors up to 2" diameter. Safe, rugged, versatile. Also available as a-c clamp ammeter, without voltage ranges.



Sensitive Relays

A line of sensitive relays including the Model 705 which provides positive operation at levels as low as $\frac{1}{2}$ microampere. Non-chattering magnetic contacts handle up to 10 watts at 120 volts.



Panel and Switchboard Instruments

A complete line of instruments in all types, sizes and ranges required for switchboard and panel needs . . . including d-c, a-c power frequencies and radio frequency, rectifier types and D.B. meters.



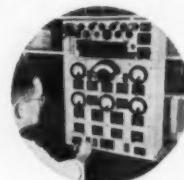
Model 697 Volt-Ohm-Milliammeter

One of a line of pocket-size meters, Model 697 combines a selection of a-c and d-c current, and resistance ranges. Ideal for maintenance testing and many inspection requirements.



Model 1411 Indetronic D-C Amplifier

Stable amplifier provides high degree of resolution even at fractional loads. Reaches steady full scale deflection in a fraction of a second. Interchangeable plug-in range standards for either microamperes or millivolts.



**Model 686
Electronic Tube Analyzer**

Tests tubes under exact operating potentials. Accurately determines true mutual conductance of all tubes, in accordance with manufacturers' rated operating conditions, or under special operating conditions.



**Vacuum Tube Voltmeter
Model 982**

Self-contained, battery operated, extremely useful in high impedance and high frequency circuitry measurements. Peak to peak measurements with input impedance of 10 megohms shunted by a capacitance of only 15 micromicrofarads with LC probe.



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One of the Reading Rooms, Reuben McMillan Free Library, Youngstown, Ohio.

AGENT: Graybar Electric Company.



Central Section, Reuben McMillan Free Library, Youngstown, Ohio.

MODERNIZING A PUBLIC LIBRARY WITH WAKEFIELD LIGHTING UNITS by WILLIAM H. AXELSON, electrical contractor

That good lighting should play a major role in the modernization of a 44-year old public library building is a tribute to the skill and imagination of the electrical contractor who planned and sold the various installations.

The biggest problem was in the central section where the beamed ceiling is 26 feet high and had originally contained stained glass skylights. To quote Youngstown librarian James C. Foutts and Assistant to the Librarian A. J. Biggins: "Some type of overall illuminated ceiling seemed to be the only answer but costs were prohibitive. Suddenly the problem was solved

economically and very satisfactorily with the production, by the Wakefield Brass Company, of Omega, an attractive surface-mounted fluorescent fixture with a Rigid-Arch plastic diffuser. After this installation the illumination level in this room stood at 55 footcandles."

The reading room presented a different problem, and here Wakefield luminous-indirect Stars were hung in continuous lines between the exposed beams. To quote the librarians again: "The resulting light is extremely comfortable with sufficient intensity and a minimum of reflected glare."

For a new catalog on the Wakefield Omega, as well as other Wakefield lighting units, write to The F. W. Wakefield Brass Company, Vermilion, Ohio. In Canada: Wakefield Lighting Limited, London, Ontario.

Wakefield Congratulates WILLIAM H. AXELSON

WAKEFIELD

VERMILION, OHIO

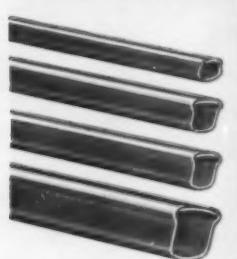
LONDON, ONTARIO

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- for modern, easy-to-install wiring methods
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200
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WIREMOLD Surface Metal Raceways

One-piece construction provides the simplest, most efficient answer for new installations, for temporary or permanent extension of existing wiring and for many difficult special-purpose wiring problems. Developed to meet the requirements of the man on the job.



1900
2000
2100
3000

PLUGMOLD Modern Electrical Outlet Systems

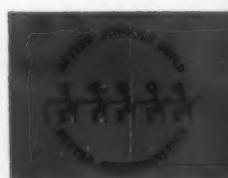
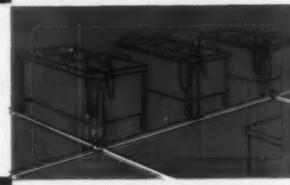
Four systems to provide electrical outlets for power or lighting applications. Snapcoil ready-wired receptacles for 1900 or 2000 provide fast, easy installation in a continuous run. For applications requiring a multiplicity of circuits, 2100 and 3000 are available unwired for wiring in the field. Capacities up to 10 No. 6 conductors.



1500
2600

PANCAKE Overfloor Raceways

Two interconnecting 'trip-proof' raceways that carry power or telephone wiring safely over-floor to any point of use . . . answer growing need for more flexible wiring layouts. Easily installed, relocated or extended.



21A
21AR
21SW
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WIREMOLD Fluorescent and Slimline Units

Small cross-section of Wiremold units makes them ideal for cove, cornice, valance, display case and luminous ceiling applications.



- From panel box to outlets . . . Wiremold it!
- A minimum number of simple, well-designed fittings mean fast, easy installation.

The **WIREMOLD** Company

Hartford 10, Connecticut



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Wheeler "D" LINE

the "NEW LOOK"
in **INDUSTRIAL LIGHTING**

New design features for better seeing.



1 MORE UPLIGHT

to reduce contrast for seeing comfort.

2 MORE EFFICIENCY

to start with and higher maintained efficiency due to self cleaning features.

3 MORE PROTECTION

for lamp holders to minimize dirt and moisture problems.

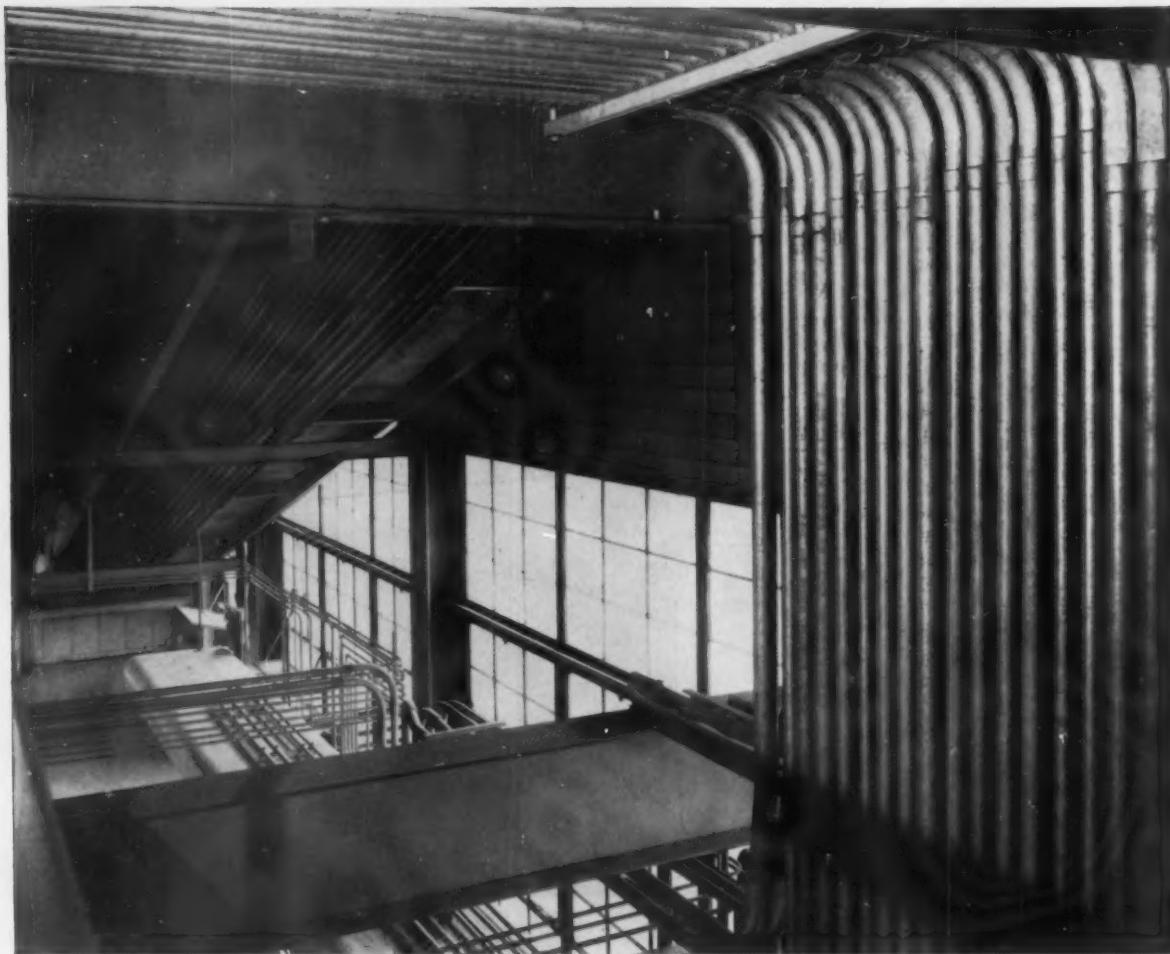
PLUS

all the extra quality features that have distinguished Wheeler lighting fixtures since 1881.



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WHY
contractors
LIKE
YOUNGSTOWN
CONDUIT

- They know it's easy to bend. Easy to thread. Easy to handle and install, especially in cramped or small spaces. And its smooth, inside finish speeds up wire-pulling and results in easier, faster installations.

Wiring in Youngstown rigid steel conduit is safe. It gives protection against damage from moisture, vibration, dust, dirt and crushing. The job is safe. And so is your reputation.

On your next job, don't take chances. Be sure there's no waste. Make sure you get the savings you should, all down the line. Ask your distributor for Youngstown Buckeye Conduit. Approved by the National Electrical Code for all hazardous locations. Buckeye electrical conduit is produced from ore to finished product by one manufacturer — Youngstown.

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Manufacturers of Carbon, Alloy and Yoloy Steel

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. . . indoor and outdoor lighting units and lamps . . . ventilating, signaling, and "intercom" equipment . . . plus cable, conduit, wiring devices, and tools needed to install them.

If it's electrical, you can get it from Graybar

SEND FOR YOUR FREE COPY, TODAY

This fact-filled booklet "24 Time- and Money-saving Ideas" gives case-history installation data . . . demonstrates conclusively the savings possible through improved utilization of elec-

trical equipment of all kinds. Write to the address below for your copy.

For more information relative to any electrical installation, however, call your nearby Graybar Representative — he'll be happy to serve you.



And, because you want efficient service, here are four more reasons why your next order for electrical equipment and supplies should read "via Graybar."

1. Graybar distributes the products of over 300 of the nation's leading manufacturers — well known lines of proved design and construction.
2. You can get complete price and specification data on all these items through your local Graybar office or warehouse.
3. Local stocks of standard electrical items and fast delivery on non-stock lines assure on-schedule deliveries for both construction and everyday maintenance jobs . . . in emergencies, shut-down time can be held to a minimum.
4. Graybar Specialists in all of the major electrical fields are always available for consultation on out-of-the-ordinary projects. You can rely on them for careful analysis of your customer's requirements and complete impartiality in product recommendations.

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Graybar Electric Co., Inc. Executive Offices: Graybar Building, 420 Lexington Ave., New York 17, N. Y. 412-193

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Local stocks of standard electrical items and fast delivery of non-stock lines assure on-schedule deliveries when you order 100% via Graybar. There's a minimum of paper work involved and there's no problem in co-ordinating deliveries from numerous widely separated suppliers. Check the list at right for the Graybar office or warehouse nearest you, then make it a point to *call Graybar first!*

ALABAMA	New Orleans	Toledo
Birmingham	Shreveport	Youngstown
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COVERING WRAP on bus bars consists of insulating layer of easily applied heavy duty plastic tape of 20 mils and a dielectric strength of 15,000 volts.



SIMPLE SPLICES are quickly, solidly and neatly insulated with plastic tape, which offers unusual thinness, high stretch for a tight and snug wrap and elimination of bulkiness.

Plastic Electrical Tapes

A review of the present day status of vinyl plastic tape in the electrical field, covering its characteristics and application.

VINYL plastic electrical tapes have made tremendous inroads in the industrial tape field since their introduction approximately five years ago. Their incorporation as insulation and protection for bus bars, switch boxes, and electrical wire splices are just a few of the reasons why these tapes have found a universal application in the electrical construction and maintenance field.

Only a few years ago, an electrician making the simplest kind of electrical splice had to be equipped with both a roll of rubber and friction tape to obtain the necessary electrical insulation and abrasion resistance. First, the slightly pressure-sensitive rubber tape was wound around the twisted wire, and then the sticky friction tape was wrapped over the rubber to secure the entire unit. Old timers, in fact, remember using matches to fuse the rubber tape to the bare copper before applying the friction tape. Two complete wrapping operations, extreme bulkiness, and the messy handling of sticky friction tape, was the net result

By Burl Keys, Engineer

*Permacel Tape Corporation
New Brunswick, N. J.*

of this commonly practiced splicing technique. Industry as a whole sorely needed a solution to this time-wasting double operation.

Tape manufacturers, cognizant of this problem, developed the polyvinyl chloride plastic tapes as an answer. These tapes had the following characteristics which made them ideal as replacement for the rubber-friction tape splicing method:

1. Pressure sensitive (self sticking)—this eliminated the need for a second tape as a securing mechanism.
2. Thinness—which substantially reduced the bulk of the splice.
3. Elongation of well over 100%—this allowed the electrician to make a snug, well-conforming cover over irregular surfaces thus eliminating air and moisture traps.
4. Dielectric strength of approximately 1700 volts per .001-thickness—

thus providing the necessary electric insulation.

5. Chemical resistance to oils, moisture, acids, alkalis and certain organic solvents—eliminating the restriction of being able to splice only in limited working areas.

6. Some plastic tapes have the further advantage of being self-extinguishing (when the source of the flame is removed, the burning of the tape ceases).

Although insulating wire splices is one of the primary functions of vinyl plastic electrical tapes, these products have, in addition, a wider range of insulating application due to their basic polyvinyl chloride characteristics. Because of the excellent water-proofing qualities and high dielectric strength of vinyl tapes (for example, a tape 7 mils thick has a dielectric strength of 10,000 volts and an insulation resistance at 96% relative humidity of 100,000 megohms), they are ideal for insulating bus bars subjected to high humidity and outdoor weathering. Heavy duty electrical plastic tapes are

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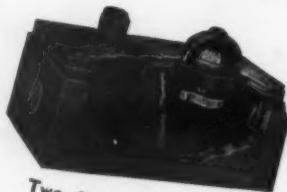
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Two Gang Adjustable Floor Box

Adjustable Boxes come in single-round or square bodies. Also in square type Single Gang, Two Gang, Three Gang and Four Gang Boxes.



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- FISH WIRE

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Plastic Electrical Tapes

... Starts on page 171



SWITCHGEAR offers many applications for heavy duty plastic tape which is suited to insulating parts in tight quarters.

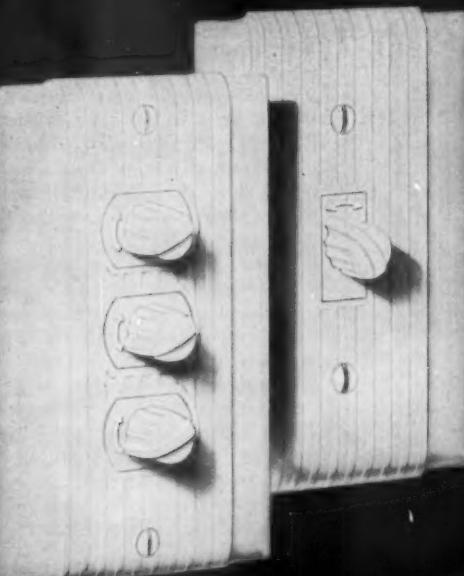
excellent as a protective covering in any heavy duty cable splicing. A plastic tape of 20 mils, with a dielectric strength of 15,000 volts, is also used in bus bar work, circuit breakers and switch gears, and in routine electrical connections to motors where the electrical insulation demands are much greater.

The extreme elongation and flexibility of the backing of vinyl tapes coupled with their electrical, mechanical, and chemical resistance properties made them a natural for insulating and protecting irregular surfaces such as wire to wire splices, or electrical connectors to electrical equipment splices. As contrasted to friction tape, where the elongation properties are limited, the vinyl tapes proved to be far more suitable in achieving a compact, form-fitting covering. These same properties made vinyl tape a natural for electrically insulating the handles of screw drivers, pliers, wrenches, and other maintenance tools.

Since vinyl tapes are highly resistant to gases, oil splash, acids and so on, numerous applications are possible where friction tape would be ruled out. Oil splash, a common plant hazard, can now be reduced to a negligible factor because of vinyl tape's impervious qualities. Motor or battery cables need no longer break down due to this cause. Corrosive action of chemical fumes, which is a serious factor in the electrical maintenance of a chemical

[Continued on page 174]

ROTO-GLO



Available in P&S Despard type for combination wiring, or conventional strap type. P&S Despard type Roto-Glo switches are rated 15 A., 120 V., A.C., 277 V., A.C.; strap type, rated 15 A., 120 V., A.C.

P&S Roto-Glo switches can be used to full current rating on fluorescent and incandescent lamp loads — and on motors where full load current is not more than 80% of rating of switch.

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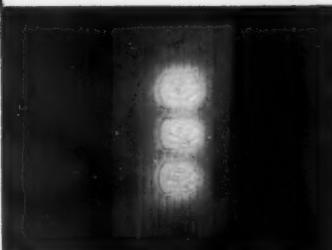
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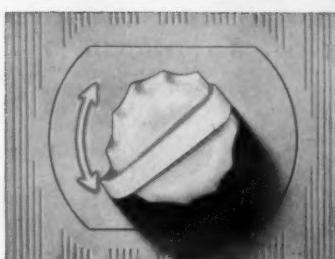
it's a LUMINOUS switch

A moment's exposure to any light source and the Roto-Glo knob will pinpoint switch location all night long.



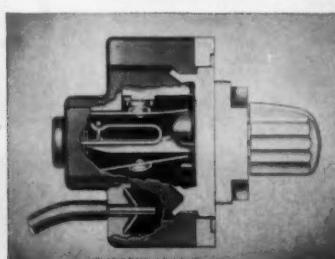
it's a ROTO switch

You turn Roto-Glo switches on just like a radio or television. The classic knob tells you it is a quiet switch at a glance.



it's a QUIET switch

Entirely new mechanism prevents vibration and noise — can be installed in any position. Screwless terminals for quick, easy wiring.



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reputation**
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Also a complete
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fuses.



Plastic Electrical Tapes

... Starts on page 171

plant, can now be negated by the use of vinyl tape. When these degrading ambient conditions exist, electrical wiring becomes brittle and the wire covering eventually rots away. As a preventive measure, many plants have completely retaped lengths of cotton wrapped wire with vinyl tape as a protective measure against corrosive action. The high abrasion resistance of vinyl tapes also make them extremely useful in splicing and protecting wires that have severed or become bare from constant abrasion or chafing.

There is obviously a huge amount of overlapping as far as these inherent characteristics are concerned in making plastic tapes universally useful in electrical work.

Ever since the introduction of plastic tapes, tape manufacturers have been keenly aware that the "shelf life" of these tapes had to be improved. The concept of a limited shelf life eventually appeared in plastic tapes that had been gathering dust in the user's stock room.

The two primary difficulties which occur are:

1. Telescoping—This form of roll distortion occurs when the tapes push outward instead of remaining flat.

2. Adhesive instability—This is the inability of the adhesive to retain its original pressure sensitive characteristics.

The tape manufacturing industry realized that these handicaps had to be reduced to an absolute minimum so that the potential difficulties entailed in inventorying and using plastic tape would be decreased. Ever since the recognition of this problem, the industry's laboratories have researched new adhesive formulas, which have been incorporated into their plastic tapes.

Despite the obvious advantages of vinyl tapes, friction and rubber tapes still outsell the plastic tapes. The fact that vinyl tapes are more expensive than the combination of rubber and friction tapes is one of the leading reasons given to explain this situation. When the compensating factors of plastic electrical tapes are examined, however, the difference in cost is more than outweighed by their many advantages, some of which are:

1. Speed and ease of handling with the resulting saving in time.
2. A mechanically and electrically superior splice and protective coating
3. Versatility.



10% to 40% Cooler Operation

... assured by Pierce Screen Vented construction. Gases and heat are allowed free escape.

No unnecessary blows during safe overloads

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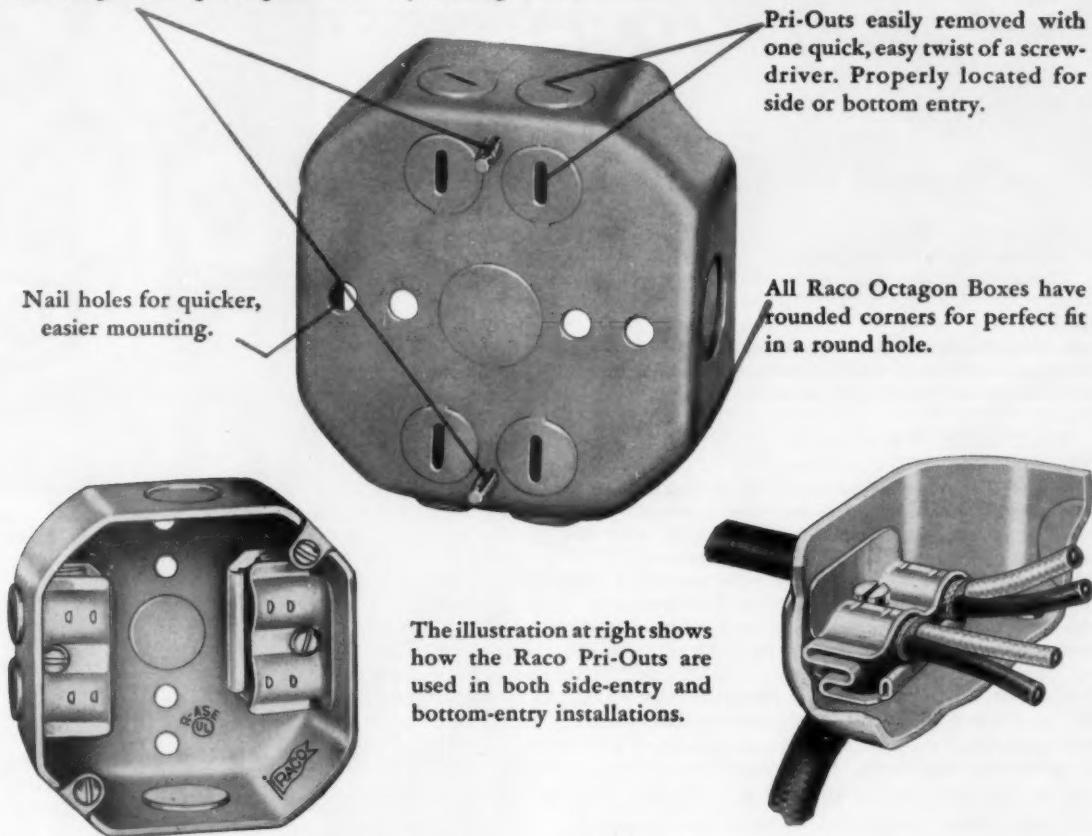
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on lower fuse costs.
Start NOW to save
and profit through Pierce
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Raco clamp screws cannot work loose. Clamps and screws and boxes are always completely assembled when received. Clamp screws are extra long with tapered points for easy starting.



RACO BOX No. 149-N CLAMPS

There's lots of wiring room in this popular Raco 4" Octagon Box. Illustrated with the N Clamp for non-metallic cable, it is available with any type of clamp to suit your needs.

**YOU'LL SAVE MONEY
WHEN YOU INSTALL
RACO BOXES**



RACO N CLAMP

**Arrows Indicate
Pressure Points**

Non-Metallic cables are gripped securely by the Raco N Clamp. Stand-up design holds clamp open to receive cable. No fumbling. Smooth surfaces of the pressure points assure a firm grip with no danger of injury to the cable.



You can Always Depend on Raco

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Practical Methods

1,000-kw Temporary Service for New York Coliseum

Main switch of 3000-amp capacity serves lights, hoists, power tools and paging system during construction of exhibition and office building.

An unusually large temporary service of 1000-kw capacity has been installed at New York City's new Coliseum. Provision has been made to handle all power and lighting needs during construction of the multi-story exhibition and office building.

The service is picked up at 120/208 volts from the utility transformer bank at one corner of the building site and connected to the main feeders through a 3000-amp service switch, meter loop and pan in an electrical shanty.

Three feeders, each made up of 4-500 MCM RH-RW conductors, are paralleled at the load terminals of the service switch and carried into the building proper in flexible metallic conduit. Inside the building, the conductors are supported in open air on insulated brackets suspended from the sub-cellular ceiling from the point of entrance to a bank of temporary switches.

The switches, ranging in size from 200 to 600 amps, control distribution to main lighting panels, elevators, material hoists, and water and sump pumps. Autotransformers are used to

step up the 120/208 voltage to the 265/460 volts required by the elevator motors.

Three main lighting distribution panels in basement electrical closets feed 66 sub-panels throughout the four exhibition floors and the 20 additional floors of rentable office space which rise above the display area. These main panels have provisions for the installation of 3-pole switches should unforeseen power needs arise.

Risers to sub-panels are No. 6 or No. 8 R or RH conductors in 1½-in. conduit. From the sub-panels, No. 12 Duplex branch circuits feed a network of double sockets arranged to provide one socket for each 625 sq ft of floor area. One half of the double socket receives a 100-watt lamp; the other provides a means of connecting a plug-in trailer to serve motor-driven appliances of $\frac{1}{2}$ hp or less. One electrician has been designated to keep tabs on construction progress and run the branch circuits as they are needed.

Permanent lighting panels will be installed adjacent to the present temporary main lighting panels. Thus it will be convenient to feed portions of



INSULATED RACKS support feeders along sub-cellular ceiling to distribution switches.

the permanent electrical installation by means of the temporary service should it be necessary before the permanent service is put into operation.

Also included in the temporary wiring is a paging system comprising 126 25-watt loudspeaker assemblies located throughout the building site and a microphone to be used by the telephone operator for locating personnel.

The Coliseum electrical installation is a joint venture by T. Frederick Jackson, Inc. and J. Livingston & Co., both of New York.



SERVICE SWITCH rated at 3000 amperes has been installed for temporary power and light.



TEMPORARY FEEDERS enter building sub-cellular from service switch in flexible metallic conduit.

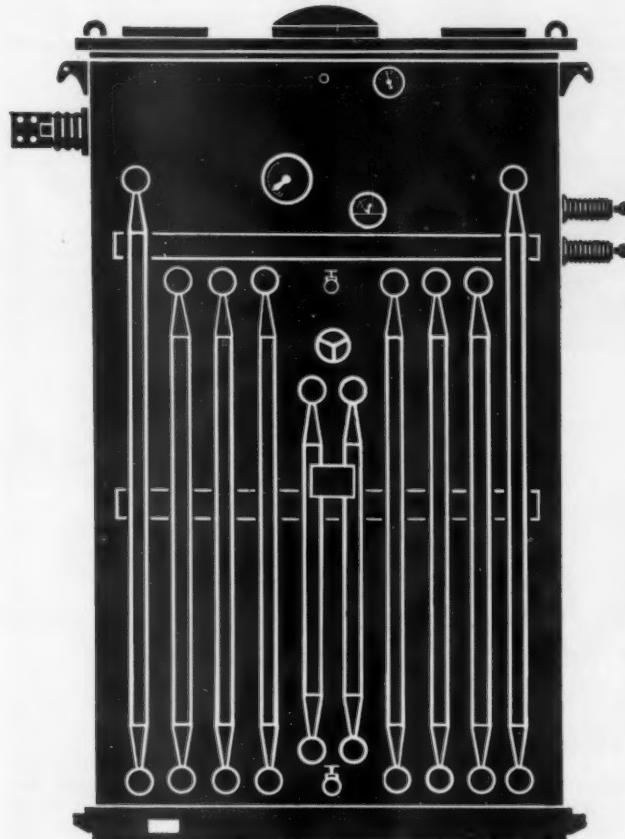
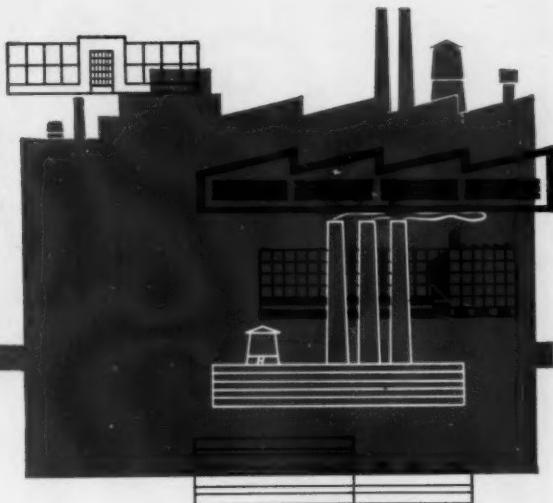
Lift Truck Has Extendable Forks

MATERIALS HANDLING

A specially designed high lift platform truck, equipped with extendable forks instead of a conventional platform, has cut original investment costs by 40% for International Fibre Board Ltd., Gatineau, Quebec, Canada.

The truck, manufactured by The Elwell-Parker Electric Company, Cleveland, Ohio, is designed to carry loads 9 ft long and 4 ft wide. Such loads may be carried crosswise on the truck's pair of 41-in. forks, or the forks may be extended to 81 inches to carry the same load lengthwise.

KUHLMAN SAF-T-KUHL TRANSFORMERS GIVE SAFER, LOWER-COST PERFORMANCE



Kuhlman Saf-T-Kuhl Transformers are filled with a patented synthetic cooling compound that is equal or superior to oil in dielectric strength, fluidity and thermal capacity. Yet the coolant is inert, non-explosive, non-inflammable and it will not sludge. The advantages of any unit employing such a coolant are well known.

- Saf-T-Kuhl Transformers can be installed anywhere in the plant without the use of expensive fireproof vaults.
- Voltage regulation can be improved and energy losses reduced by installing Saf-T-Kuhl Transformers near load centers and the expense of running long and large copper conductors can be eliminated.
- Floor space can be utilized exclusively for production by installing Saf-T-Kuhl Transformers above or below floor level.
- Maintenance costs are lower because the coolant does not require filtering or reconditioning.
- Insurance rates are lower in most states because Saf-T-Kuhl Transformers are absolutely safe and fireproof.

Saf-T-Kuhl Transformers are especially engineered to meet the requirements of heavy duty industrial service. The entire insulation structure is coordinated with the basic impulse level. Assemblies are thoroughly dried, and the coolant is introduced under vacuum to prevent entrapment of air and insure high insulation strength. Large ducts permit free circulation of the coolant to eliminate the danger of hot spots. Tanks are completely sealed. Cover and bushing gaskets are made from a special cork and synthetic rubber compound that gives exceptionally long life.

Kuhlman Saf-T-Kuhl Transformers are produced in a wide variety of single and three phase ratings. For complete information, write today for Bulletin CS-501. Kuhlman also manufactures, Power, Distribution, Dry Type, Subway, CSP and Series Street Lighting Transformers. Ask for bulletins on these units as well.

154-T

KUHLMAN

KUHLMAN ELECTRIC COMPANY, BAY CITY, MICHIGAN • CRYSTAL SPRINGS, MISSISSIPPI • SALINAS, CALIFORNIA

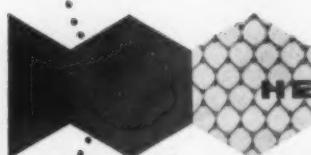


IBM

CHOSES **HONEYLITE** *

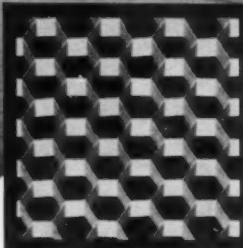


... because of its high efficiency, low surface brightness and unusual acoustical properties. Installation was simple, inexpensive. The material used in HONEYLITE ceilings is non-combustible, and approved for suspension under fire prevention sprinkler heads. HONEYLITE is efficient, safe ... strikingly beautiful when used in full ceilings, troffer diffusers or industrial and commercial fixtures. Additional information on request.

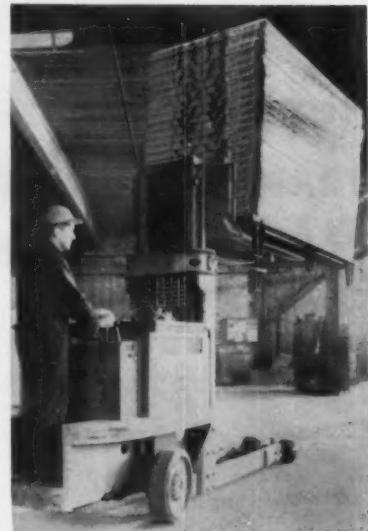


HONEYLITE LIGHT-DIFFUSING
ACOUSTICAL ALUMINUM HONEYCOMB
CEILINGS ARE A DEVELOPMENT OF

HEXCEL PRODUCTS CO.
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OAKLAND 8, CALIFORNIA



HONEYLITE troffer louvers in modern room housing IBM 702 electronic data processing machine at IBM's Poughkeepsie, New York, plant. Inset shows close-up of aluminum honeycomb.



LIFT TRUCK has extendable forks which enable it to lift and carry loads 9 ft long and 4 ft wide, either crosswise or lengthwise.

The company uses the unique truck for warehousing and car loading operations 16 hours a day. During a typical 8-hour shift, it will handle as much as 100 tons. A much larger truck would have been required to handle the 9-ft loads if a standard fork type model had been chosen. Because of the reduction in truck size, the 40% saving in original costs was made possible.

The present truck provides a 113-in. lift with telescoping uprights to facilitate ceiling-high tiering. Since forks are used, pallets or skids can be utilized interchangeably, although it is possible to handle loads directly on the forks themselves. Because of the truck's four-wheel steer, it is highly maneuverable and effective in car-loading operations.

Phase-Rotation Instrument

TESTER

The instrument described below was developed by L. Dan Johnson, Plant Engineer at the State Prison of Southern Michigan.

In Fig. A the reactor coil may be any small winding possessing an impedance nearly equal to resistance of one of the lamps used (6, 7½, 10 or 15 watts).

If B is brighter than A, voltage B_o is greater than A_o, and junction point O of the vector diagram (Fig. B) falls on circle as shown. Current through lamps is in phase with B_o so will also meet at O. Voltage across reactor will

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60



Bronco 60 Certified Type W cables are made in all sizes from 8/2 to 1/4. They have a tough Neoprene jacket certified by a registered professional engineer to contain not less than 65.46% Neoprene. Made with coarse or fine stranding, Certified Type W possesses incomparable flexibility. The proof is in the product. Try Bronco 60 Certified Type W—you'll standardize with Certified.

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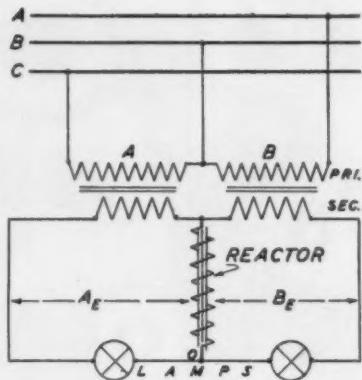


FIG. A
CONNECTION DIAGRAM OF PHASE-ROTATION INDICATOR.

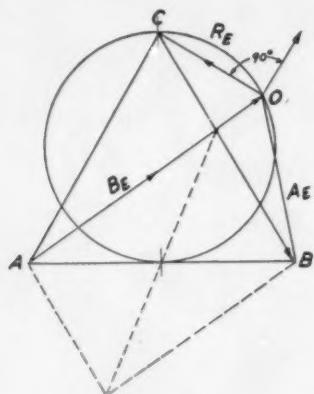


FIG. B

VECTORIAL ILLUSTRATION INDICATING PHASE-SHIFTING FUNCTION.

be R_E and will lead reactor current by 90° , indicating A-C-B rotation.

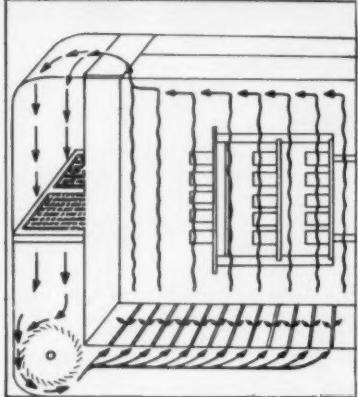
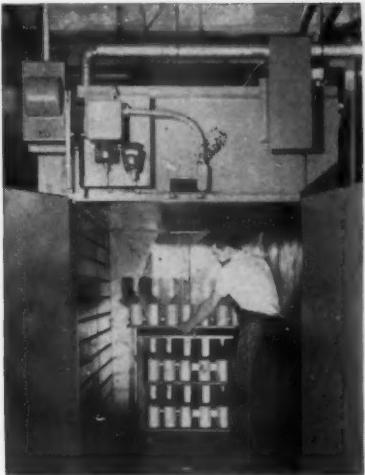
Black, red and white leads are recommended; reversal of any two leads will reverse the preceding action, thereby dimming lamp B and brightening lamp A with a corresponding change in phase rotation: C-B-A.

Total weight of the device should not exceed $\frac{1}{2}$ lb., with dimensions to fit the appropriate pocket. All voltage-reducing auxiliaries should be separate from the instrument itself.

Baking Oven Uses Electric Heaters

PRODUCTION

An improved quality of finish has been obtained by a manufacturer of surgical instruments by installing electric duct heaters in the baking oven. Electric heat was chosen because it permits sensitive temperature adjustments to be made by thermostatic control to provide for changing sizes of parts, paint formulas and other specifications. An extremely flexible oven was needed, because the products being



BAKE OVEN is heated by electric resistance heaters, has thermostatic control, and provides flexible accommodations for heating large and small parts of many shapes and finishes. Diagram shows heat circulation within oven.

finished come in a variety of sizes and shapes with little volume in any given one.

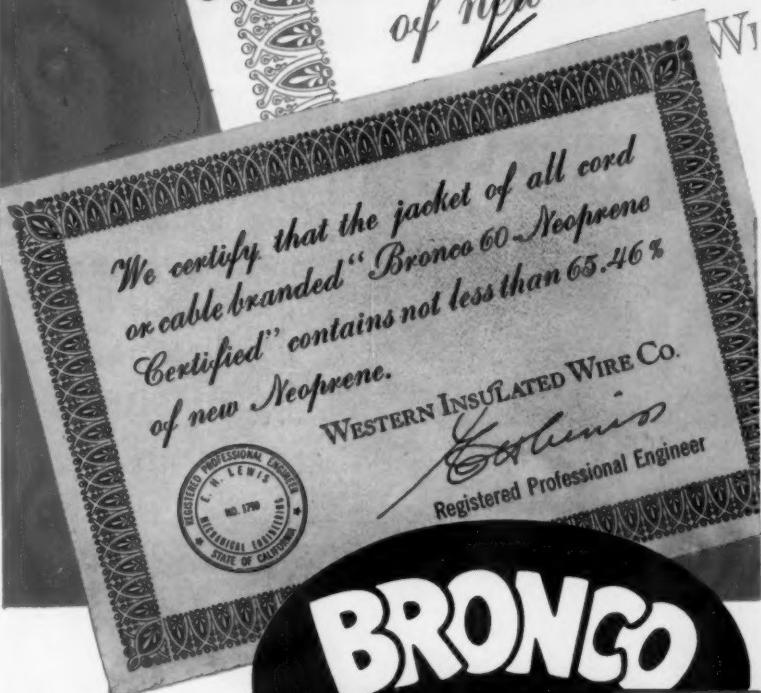
A small oven had previously been used to bake some parts, but larger pieces had to be air dried. This presented problems in handling and stacking, and a large amount of floor space was required to store parts with different drying times. As a result production suffered.

The new oven was designed to accommodate both large and small units. Other variable requirements are met by means of flexible heat controls—a thermostat with indicating dial, plus an upper-limit safety control. Two Chromalox electric air blast heaters, made by Edwin L. Wiegand Company and rated at 20 kw each, were selected for easy installation in the air duct of the plenum chamber.

Uniform heat is provided throughout the oven by means of a fan which circulates air through the finned heaters and down into the lower heating chamber. Louvers on the side wall

We certify that the jacket of all cord or cable branded "Bronco 60 - Neoprene Certified" contains not less than 65.46% of new Neoprene.

WESTERN INSULATED WIRE CO.
Los Angeles
Registered Professional Engineer



This certification which appears on every box and reel of Bronco 60 Certified portable cable assures you that the protecting jacket contains a bonus quantity of Neoprene... 65.46%! More Neoprene gives you greater oil-resistance, longer wear, more flexibility. No guesswork. No purchasing by faith alone. You know what you are getting. This certificate tells you exactly what...and how much. Be sure the wire you buy is Certified...and branded.



BRONCO 60 CERTIFIED is sold only through Electrical Wholesale Distributors and is manufactured by
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NEED TO VENTILATE AN OFFICE — OR COOL A COLISEUM?



1,439,000 cfm breeze by "Buffalo" Package Propeller Fans ventilates this mammoth new Heart O' Texas Coliseum at Waco, Texas. Mechanical Contractor: Nuckols-Cathey and Co., Inc., Waco, Texas.



BIG installation savings! Supplied as "Packages", complete with motor and V-belt drives. Part of 60 Belt-Air Fans in Coliseum.

With this greatly expanded and improved line of "Buffalo" package Propeller Fans, many ventilation jobs once considered too costly or impractical are now being done to satisfaction. First cost and installation savings are significant. Performance, of course, is the big test — amply proved by the fact that the gigantic air moving job at the Coliseum above is done on a total of only 66 horsepower! "Buffalo" Package Propeller Fans in sizes from 8" to 144" are ready to give you equal satisfaction. Write today for BULLETIN FM-1234 on your company letterhead, and see the wide range of applications. NOTE: no one type of fan is the "answer" to all types — centrifugal, axial flow and propeller fans — each with the "Buffalo" "Q" Factor* of bonus performance built into it. Bulletins on request.

*The "Q" Factor — the built-in Quality which provides trouble-free satisfaction and long life.



INDUSTRIAL EXHAUSTERS

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PUBLISHERS OF "FAN ENGINEERING" HANDBOOK
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Sales Representatives in all Principal Cities

BELTED VENT SETS PROPELLER FANS "E" BLOWERS-EXHAUSTERS

direct the hot air so that the contents of the oven are heated evenly. Air is recirculated back through the heaters except when volatile content reaches a point that makes it necessary to exhaust some of the air through blast gate dampers.

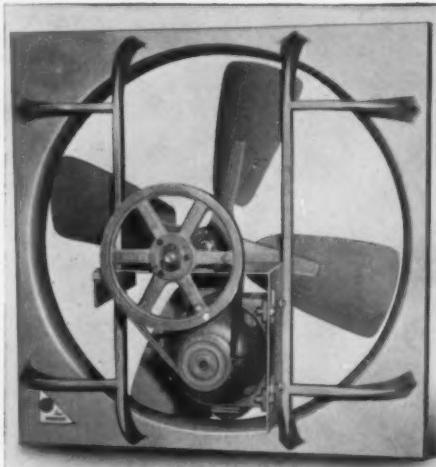
Fitting Ball Bearings on Shafts

REPAIRS

New ball bearings can be easily damaged and their useful life considerably shortened if they are hammered on to their shafts without care. The interference fit between an inner race and the shaft is very small, and if the race can be expanded by a very small amount, fitting to the shaft will be an easy job. Expansion of the bearing can be achieved by heating it, but this must be done carefully to avoid softening or other damage to the balls and races.

A safe method of heating a ball bearing to obtain slight expansion is by placing it on top of a 60-watt incandescent bulb which is mounted base-down in its socket. The heat imparted to the bearing in this way is about the maximum which can be applied without damage to the temper of the bearing metal. The expansion of the bearing is not very much when heated this way, but it is sufficient to convert a driving fit to a push fit and ensures that races can be fitted without hammering.

By cutting a suitably sized hole through the paper wrapping of a new ball bearing so that metallic contact can be made with the hot bulb glass, the bearing race can be expanded with little grease loss and dirt exposure.



HUSKY — EFFICIENT! Note sturdy die-stamped construction of this Design 53 Belt-Air Package Fan. Thirty-six 54" and twenty-four 42" Belt-Airs move 1,439,000 cubic feet of air per minute in the Heart O' Texas Coliseum — on 66 h.p.



INCANDESCENT LAMP, 60-watt size, is shown held base-down in a vise, with the bearing resting on the round bulb surface.



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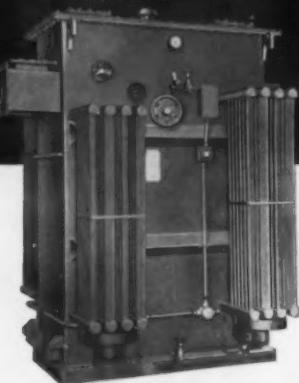
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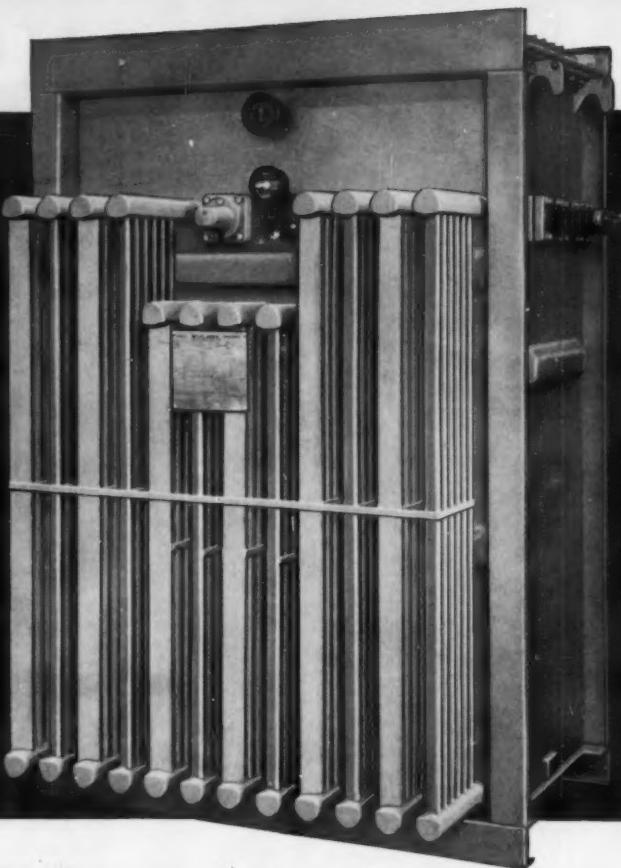
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Close-Coupled
Unit Substation
Transformers



Wagner

**THROAT-CONNECTED UNIT
SUBSTATION TRANSFORMERS**

For outdoor installation, or for applications where it is desirable to locate the transformer away from the switchgear, Wagner can furnish these liquid-filled transformers in ratings to 2000 kva, 15 kv and below. Bulletin TU-13 gives full information.



Now, Wagner liquid-filled unit substation transformers are available in new, improved close-coupled units, rated from 300 to 2000 kva, that can be flush-mounted with any make of switchgear. They can be used in both single and double-ended unit substations to form neat, compact, streamlined substations for modern industrial service.

Bushings are provided on the ends of the close-coupled transformer for connection to the switchgear. The bushing heights are designed for a minimum distance from the base, giving ample room to make connection to switchgear or busses in the switchgear compartment or transition section.

In this type design it is not necessary to coordinate bushing height of transformer and switchgear as in the throat connected units which often require special throat heights to match special switchgear. This feature means that a standard transformer can be used for special switchgear application with a minimum of engineering coordination, resulting in shorter deliveries.

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Motor Shops



ASSEMBLING FRAMEWORK for monorail is facilitated with use of bolts, and use of this rig provides ample jobsite power for raising or moving heavy equipment.

Pre-Fab Monorail Rig Aids Jobsite Repairs

Handling heavy motors and other equipments on a customer's premises is frequently complicated by cramped working space or by the lack of lifting power. So says Ed Kotz, Jr., shop foreman for Electric Motor Repair Company, Trenton, N. J., who formerly faced these problems when attempting to make rush on-the-job motor repairs in order to restore service in minimum time to essential operational drive units. Now, however, lifting power is provided by a chain hoist, and the hoist moves along an 8-ft I-beam supported 8 feet above the floor. Each side of the beam is held by a framework of channel irons that may be assembled in place by means of bolts in less than half an hour. When the job is completed, the framework may be quickly dis-assembled and reloaded piecemeal back into the company truck.

With this portable rig it is now possible to accept jobs which were formerly impossible or extremely difficult. Manual effort has resutltingly been reduced, and overall time spent on these large jobs has been lessened materially.

Hydraulic Jack Powers Shop-Built Arbor Press

An arbor press is one of the handiest pieces of equipment in a motor repair shop. Many shops have one or more

units of different capacities to meet the requirements of their specific operations, particularly that of removing and pressing-in bearings in motor end bells.

Frank Ross, owner of Ross Electric Motor Shop, Fairmont, Minn., designed and built a small 8-ton press to meet the needs of his own shop. Basically, it consists of a free-standing channel-iron frame with an adjustable work support and hydraulic-jack work-head.

Uprights for the press-frame are 70 inches high and consist of sections of 3-in. steel channel mounted back-to-



HYDRAULIC JACK is power unit for this small arbor press built from sections of 3-in. and 5-in. steel channel. Unit has 8-ton capacity, features movable work-head and adjustable work-table. Owner Frank Ross demonstrates use of press to remove bearing from motor end bell.

back and spaced about 5 inches apart. Welded, flat-iron brackets maintain this spacing from top to bottom where pieces of 2-in. angle-iron form the "feet". The cross-piece at the top of the frame is fabricated from two 28-in. lengths of 5-in. steel channel welded, face-to-face, to the uprights. A narrow opening between these two channels accommodates a bolt-saddle suspended from a small truck (a short length of inverted 3-in. channel with rollers) which rides the top of the channels. This assembly supports an inverted 8-ton hydraulic jack to form a movable workhead which can be positioned laterally to center on the work piece. Tightening the retaining nuts on the two saddle bolts locks the workhead in the desired lateral position.

End bells rest on a movable worktable consisting of two lengths of 5-in. steel channel which bridge the uprights and can be raised or lowered as desired. Four bolts, with spacer sleeves, keep the channels in alignment. The worktable can be positioned at five different levels by inserting 12-in. long, $\frac{1}{2}$ -in. diameter steel pins through holes in the channel uprights. The table rests on these pins. The first group of positioning holes are 12 inches above floor level; the others are on 8-in. centers.

When using the press, Ross first raises the worktable to the desired height, then places the end bell, or other work, on the table. Next, he centers the jack-assembly over the work and tightens the nuts on the saddle-bolts. The jack-screw is then adjusted to meet the work. Final pressure is applied by pumping the hydraulic jack handle until the bearing is either removed from or pressed in the end bell. Both Ross and his mechanics are well pleased with the convenience and efficiency of this latest addition to their shop equipment.

Swivel Worktable Has Built-in Welder

Operating efficiency is a key point in the layout of Ross Electric Motor Shop in Fairmont, Minnesota. All electrical equipment is cord-connected to strategically located plug-in power and lighting receptacles so that a shift in departments can be made quickly without any extensive or costly change in the electrical distribution system. Equipment items are grouped and lo-

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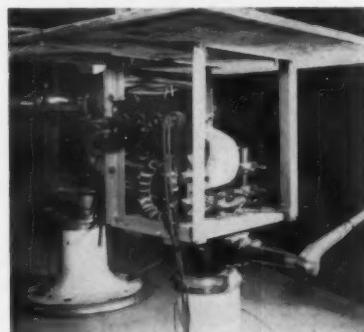
ELECTRIC COMPANY

112 Plum Street, Trenton 2, N.J.

Our friends



SWIVEL WORKTABLE, on barber-chair base, raises and lowers to comfortable working height, has built-in electric welder for making coil-end connections on rewound motors. Mechanic simply turns table-top as he goes around stator welding magnet wire ends.



WELDER COMPONENTS are mounted to box-frame under table. Transformer with oversize core provides welding currents ranging from 2.5 amps to 100 amps through taps on connection block. Jack-plug leads are coiled on side-brackets.

cated for most efficient operation of specific departments.

Owner Frank Ross did not stop with layout flexibility in his quest for over-all increase in production efficiency. He directed his attention and talents to individual units of shop equipment in an effort to slash man-hours to a minimum on various operations. Typical of the results attained through his searching analysis of departmental techniques is the use of swivel worktables in the stator winding division.

Ross reasoned that it would be less tiring for a mechanic to shift a motor stator on a swivel-top table than to wrestle the motor to a convenient working position on a stationary bench. His experience in shop operation proved that the calibre of a mechanic's workmanship and over-all efficiency increased as the fatigue-factor decreased. So he devised two swivel-top work-

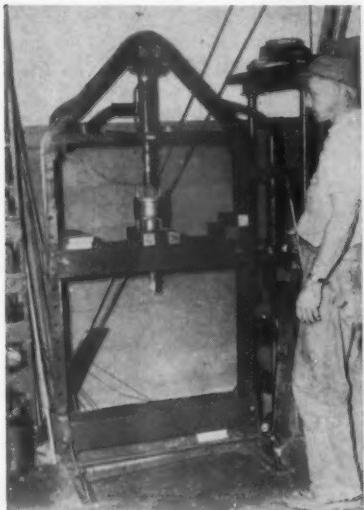
tables which can be raised or lowered to a comfortable working height and can turn a full 360 degrees. Both tables are mounted to discarded barber-chair bases which incorporate the lifting and swivel mechanism. Both have plywood surfaces mounted to an angle-iron box frame. At one, a mechanic inserts the wound-coils into the stator slots. At the other, the mechanic uses an electric welder to make the coil-end connections.

Further simplification of the welding operation was attained when Ross incorporated a welding transformer and connection block in the box frame under a swivel table with a 36-inch square work surface. The 40-volt welder, with a 220-volt, single-phase input, has an oversize core as a safety factor. Secondary taps provide welding currents ranging from 2.5 amps to 100 amps. When working on coils wound of fine wire, the mechanic plugs the input lead into an 110-volt outlet.

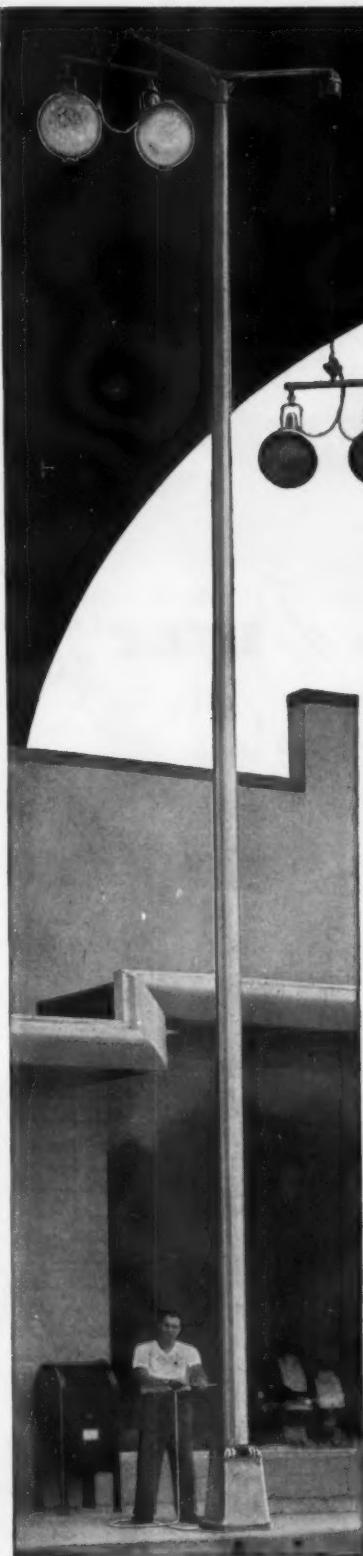
This combination welding table works exceptionally well and is only one of the many shop-improvement ideas devised by Mr. Ross, who is the national chairman of the National Industrial Service Association 1955 Awards Committee. This committee supervises the annual NISA Awards Contest designed to uncover time-saving and cost-cutting ideas among member shops.

Hydraulic Ram Augments Hand Press

A manually-operated hand press has been converted into a hydraulic unit,



SMOOTH FORCE is applied in this yoke press from an inverted hydraulic jack which was used to replace manual effort in the Electric Motor Repair Company shop.



THE FACTS OF LIGHT

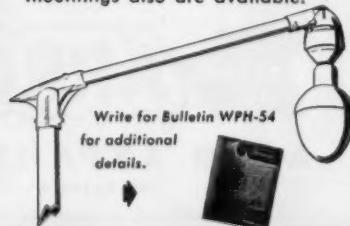
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FACT NO. 2: ALL SERVICING HAZARDS ARE ELIMINATED. Workman has both feet on the ground and both hands on the job at all times. In addition, lowered fixture is "dead" because live contacts remain at pole top.

FACT NO. 3: SERVICING TIME AND COSTS ARE REDUCED TO MINIMUM. One man, using only a light vehicle, now can maintain pole-mounted luminaires in a fraction of the time formerly required. Faster servicing and elimination of costly auxiliary equipment assures substantial savings as well as increased lighting efficiency.

FACT NO. 4: "SERVISAFE" POLE UNITS ARE SUPPLIED AS COMPLETE PACKAGES READY FOR WIRING AND ERECTING. Featuring decorative as well as functional qualities, both single and double-arm models can be furnished with a variety of new steel and aluminum poles. "Servisafe" Bracket Units for wall and wood pole mountings also are available.

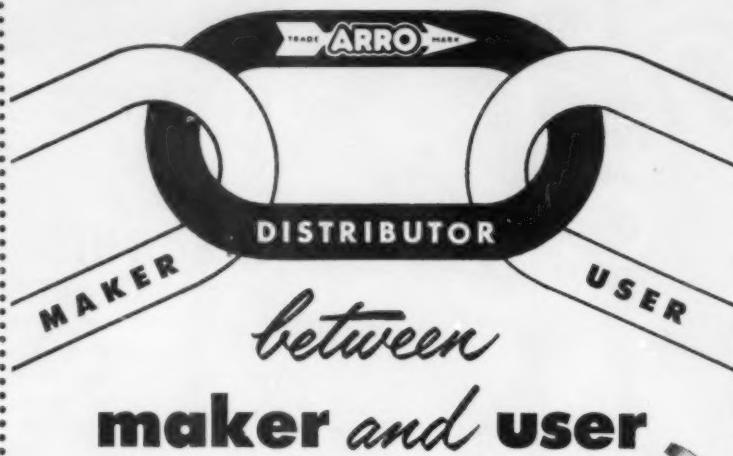


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in the Electric Motor Repair Company shop at Trenton, N. J., thereby speeding and lessening the job of pressing shafts, stator cores, bearings and so forth during various motor reconditioning stages. The heart of the new unit is an inverted top-mounted hydraulic jack, with the fluid cylinder mounted on the side of the press frame. By applying the associated hydraulic force in this manner, manual effort is multiplied many fold and force is exerted more evenly, faster and to a greater degree.

Thumb Screw Is Feature of Suspension Clamp

A clever gadget for holding armatures has been developed by the Industrial Electric Company of York, Pa., making it possible to lower the armature into a varnish tank or suspend it in a bake oven with minimum effort. The rig consists essentially of a short section of 1-in. pipe with a bolt passing through a threaded shoulder near one end of the pipe. The external end of the bolt is fitted with a thumb screw for easy turning, and the interior end of the bolt is equipped with a floating copper shoe which presses against the armature shaft. The other end of the pipe is fitted with a strap hanger, welded securely to the shanks of the pipe, and this hanger can slip over a pulley hook or rack rod.

In operation, the rig is placed over one end of the armature shaft and the



PUTTING ON THE PRESSURE is simple trick when thumb screw is turned on this pipe collar. Collar slips over armature shaft and holds unit suspended at desired elevation. Internal shoe prevents damage to shaft.

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bolt is tightened, the shaft being protected against denting or scoring by the shoe. The pulley rope is slackened until the armature is suspended at the desired level; then the rope is snubbed around a conveniently placed wall cleat. Several of these clamps are now in use in the Industrial Electric shop and are enthusiastically promoted by foreman Dave Miller.

**Portable Infrared Rig
Is Simply Constructed**

Utilization of infrared heat for baking purposes need not involve an elaborate set-up to produce satisfactory results. This is demonstrated by the rig designed and constructed in the shop of the Industrial Electric Company, York, Pa., where small motors are rewound in considerable quantities.

This rig is portable, mounted on castors for easy shifting around the shop, and it consists essentially of two vertical pipe members spaced 4 ft apart. The tops of the two pipes are connected by two horizontal bars, one of which is straight (serving as a suspension medium for hanging impregnated coils or wound components), while the second rod is semi-circular in shape, swinging out between the two uprights in a horizontal plane. This curved track serves to support a heavy canvas curtain and, when the rig is positioned next to one of the shop's concrete-block walls, the curtain and wall combine to confine the radiant heat within the space so enclosed.

On each of the two uprights seven pipe clamps are positioned, these clamps holding rods to which outlet boxes, lamp sockets and the infrared lamps are mounted. Arms and lamps



ADJUSTABLE ARMS make it possible to locate infrared lamps close to an armature being baked, while heavy canvas curtain confines radiant heat to local area enclosed.

may be extended or rotated as desired, making it possible to position heat sources close to the work which is to be baked.

A mobile drip tank is also used when baking small units, consisting of a metal-covered wooden rack with bottom panels sloping towards a central drain hole. Beneath this drain a salvage can catches residual varnish, thereby keeping the drip tray unclogged and eliminating the necessity for frequent cleaning.

This rig is admittedly not as efficient as a permanent oven and it does not take the place of one. However, for small jobs, particularly when the main ovens are loaded to capacity, this movable pipe-rack adjustable heating medium is of definite assistance in absorbing the overload and keeping repair schedules moving.

Pivoted Warning Prevents Shocks

A pivoted sign, supported by brackets mounted to the face of a test panel, has saved many a shock in the shop of Berks Engineering Company, Reading, Pa., because the sign warns all shop personnel when a fellow worker is handling bare cable leads or terminals. Since the sign, when in the "down" position, is directly in front of the controls, the likelihood of accidentally placing power on the restricted cables is completely eliminated and, since the sign is bolted to the brackets, it cannot be laid aside, misplaced or forgotten. Being pivoted, it can be flipped up and out of the way when the danger element is not present and the testing facilities are available for use.

This arrangement makes it easy to play safe and, as testified by the absence of shocks, the method has proved to be as effective as it is simple.



EASILY FLIPPED SIGN can be raised out of the way to reach test-panel controls, or lowered in front of the controls when operation of same would endanger shop personnel working on cable leads or bare terminal lugs.



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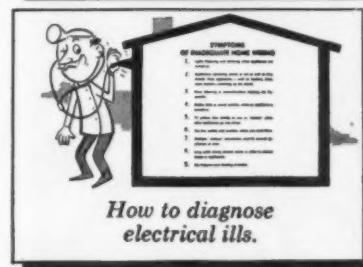
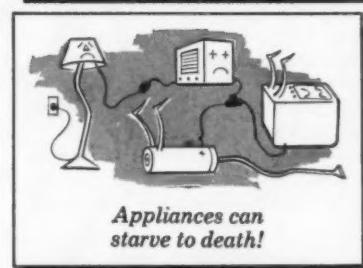
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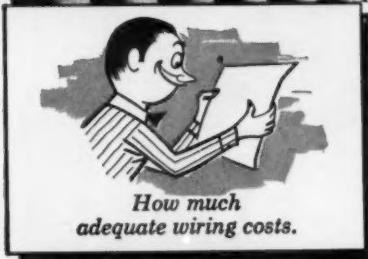
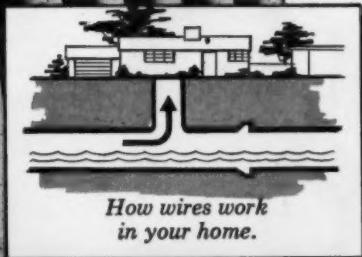
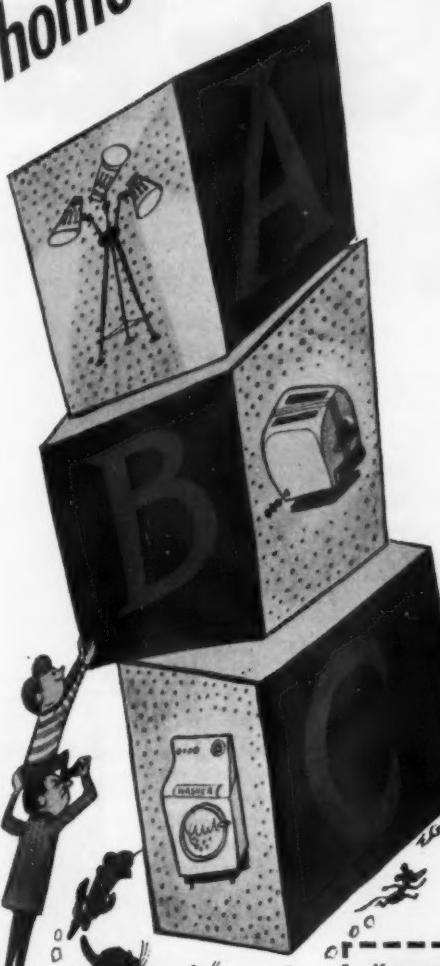
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CONDULETS

FLOODLIGHTS

TRAFFIC SIGNALS

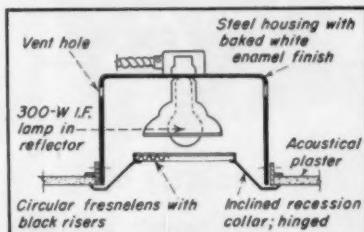
AIRPORT LIGHTING

Modern Lighting

Brightness Reduced with Lens Coloring and Regression

An installation consisting essentially of Gotham recessed, regressed Fresnelens Downlites provides general illumination in the order of 30 footcandles within the Rogers Peet store for men at 600 Fifth Avenue, New York City. The unit is circular, has a plaster

frame approximately 16 inches in diameter and has a tapered collar that supports a 13-in. Fresnelens plate 1½ inches above the ceiling plane. This regression of the lens minimizes visual brightness of the fixture when viewed from a distance, and the coloring of



FRESNELENS DOWNLITE has lens recessed above ceiling level to minimize brightness of unit when viewed from a distance, while risers of lens are colored with flat black ceramic paint to reduce brightness of source when it is viewed from acute angles.



MONOPONT ACCENTLITES are recessed in ceiling to highlight free-standing displays placed on case tops. These units may be rotated 358 degrees if desired and tilted from the vertical to angles up to 45 degrees. Illumination in glass floor cases is from T-6 slimline lamps incorporated into narrow reflectors placed beneath leading edges of the cases.



PERIOD CHANDELIERS, recessed lensed downlights and valances extended continuously above wall cases are used in combination to achieve a decorative yet utilitarian lighting treatment in this New York men's furnishing store.

lens risers with flat black ceramic paint greatly lessens fixture brightness when the angle of viewing is more acute. Fixtures contain 300-watt inside-frosted lamps, while heat dissipation within the white enameled steel housing is improved through the incorporation of vent holes.

But although general illumination is relatively moderate, merchandise on racks, shelves, counters and in cases is effectively emphasized in local areas where intensities up to 150 footcandles are prevalent. Units providing these accent intensities include recessed spots and floods, valances and floor-case frame coves.

Recessed spot units are generally Gotham monopoint accentlites with provisions for both horizontal rotation and vertical tilting of the contained PAR lamps. In these units, bottom cover plates are pierced with elongated apertures, thereby permitting passage of the full effective light beam with the lamp in all possible positions. Tilting of lamps may be made without removing the bottom cover, by turning a small accessible knob on the fixture's lower exterior that rotates a tilting pinion mechanism. Spill light is contained within the enclosure by means of annular louvers and collar baffles. These units are used to highlight free-standing displays arranged on aisle islands and counter tops. Depending upon height of ceiling, lamps are either side-prong 150-watt PAR-38s or 200-watt PAR-46s, the latter producing a beam of 50,000 candlepower.

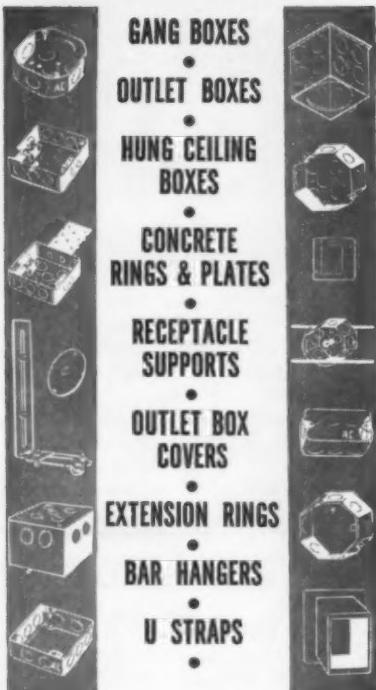
Suits, shirts and accessories displayed in wall cases are also highlighted by means of various valance treatments positioned just above and

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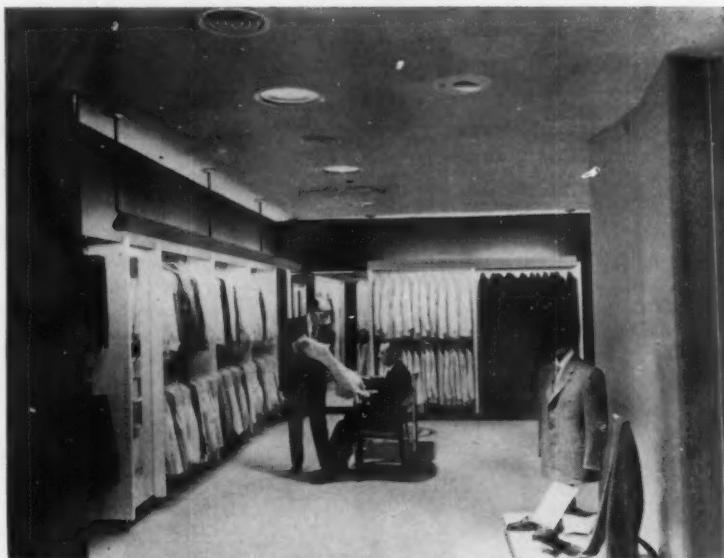
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WALL CASES are highlighted by continuous single row of deluxe warm white lamps in overhead valance, while free-standing display against opposite wall is illuminated to intensity of 150 footcandles by ceiling-recessed adjustable-angle spotlight. General illumination in the order of 30-fc is provided by means of recessed Fresnelens Downlites.

in front of the racks. Distances of valances from walls range from 10 to 13 inches; lamps are T-12 deluxe warm white, and lamps are consistently arranged in continuous single rows. Deluxe warm white lamps are also installed above full-length mirrors; two rows being shielded by ribbed glass diffusing panels.

Merchandise displayed within the many glass floor cases is illuminated by means of 42-in. T-6 single-pin slimline warm white lamps contained in trim reflectors incorporated into upper frames of the cases.

The final lighting treatment used in this smart Fifth Avenue store is primarily decorative, with ornamental 12-lamp shaded-filament chandeliers suspended from the acoustical tile ceiling.

These several techniques all combine to present merchandise effectively, and they reiterate the truth that lighting is the most important instrument in selling. The installation was by electrical contractors J. Livingston & Co., in accordance with plans developed by architects Carson and Lundin, interior designer Raymond Loewy, and electrical consultants Smith and Silverman.

Hotel Relights Lobby with Period Designs

The Lord Baltimore Hotel in Baltimore, Maryland, recently refurnished its entire main floor lobby, including the mezzanine area, at which time it made a complete changeover from its former modern motif to a new and pleasingly soothing traditional decorative treatment. This included the removal of the former modern design fluorescent lighting units from the ceiling and the installation of new incandescent luminaires of colonial Williamsburg design.

The Lord Baltimore Hotel was built originally in the late 1920's, at which time the trend in decorative treatments was to modern. So the furnishings, rugs, furniture, draperies, lighting and finishes were all done in modern. After fluorescent lighting was introduced in 1938, the lighting units were replaced with new fluorescent luminaires surface-mounted on

the ceiling to further carry out the modern treatment.

During 1954 it was decided that the entire lobby needed to be modernized, brought up to date with fresh new paint, and with new furniture and furnishings. H. Chambers & Co., Baltimore decorators, were called in to do the job. After they had studied the problem and had recommended a colonial treatment as more in keeping with the historical background represented by the hotel's name, it became apparent that some changes should also be made in the lighting system. H. M. White, illuminating engineer with the Consolidated Gas Electric Light and Power Company of Baltimore, was called in for suggestions, and he strongly recommended traditional design chandeliers. At his further suggestion, the Edward F. Caldwell Company of New York was asked for



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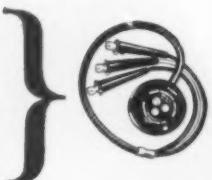
Well-built and shock-proof in a LAMINATED Bakelite housing, the Knopp Voltage Tester tells immediately and simply if circuit is open or closed; magnitude of voltage between 110 and 600; a-c. or d-c. pure or rectified; 25 or 60 cycles, for testing old and new circuits, fuses, locating grounds, etc.

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Electrical Facilities Inc.

4232 HOLDEN STREET, OAKLAND 8, CALIF.



LOBBY of Lord Baltimore Hotel, Baltimore, Md., was recently redecorated and relighted. The former modern motif was replaced with traditional design, including chandeliers which are replicas of designs in the Williamsburg restoration. Average illumination level is ten footcandles, and warm in appearance.

specific luminaire designs, and they provided these based on replicas from the Williamsburg collection.

The lobby is 48 ft by 80 ft, with a ceiling height of 27 feet in the center. Under the mezzanine the ceiling height is 11 ft-9 in., and over the mezzanine it is 13 ft-14 in. A large 60-amp luminaire hangs in the center of the lobby from the high ceiling while 28 luminaires, all of the 8-lamp style, are installed on the ceilings over and under the mezzanines. All lamps used are of the 40-watt Type A-17 incandescent type, concealed in appropriate lamp shades. These lamps are 125-volt rated, and are supplied with 120 volts to sockets, less the voltage drop in the branch circuits. This allows the lamps to operate "under-voltage", which adds to the warmth of their light output color and increases their lamp life.

A maintenance schedule has been established for relamping these luminaires. The 284 lamps are group replaced every 46 days (or 1104 hours) of burning, as these lamps are kept burning 24 hours per day. It is estimated that the life expectancy operated under-voltage as they are would be about 1600 hours. But by replacing them at the end of 1100 hours practically no outages occur between replacements.

A lighting intensity of approximately ten footcandles results from the new system, which is more than existed with the fluorescent, and is much warmer in appearance. The ceilings and side walls were refinished in eggshell white. New rugs were

provided for the central lobby area, and all chairs, sofas, and tables and furniture are true Williamsburg design and finish.

This work was approved and supervised by the owners: H. Nelson Busick, President; Howard Busick, Manager; and Morton Busick, Purchasing Agent—three brothers. The electrical work and luminaires were supplied by Blumenthal-Kahn Electric Co., Baltimore electrical contractors.

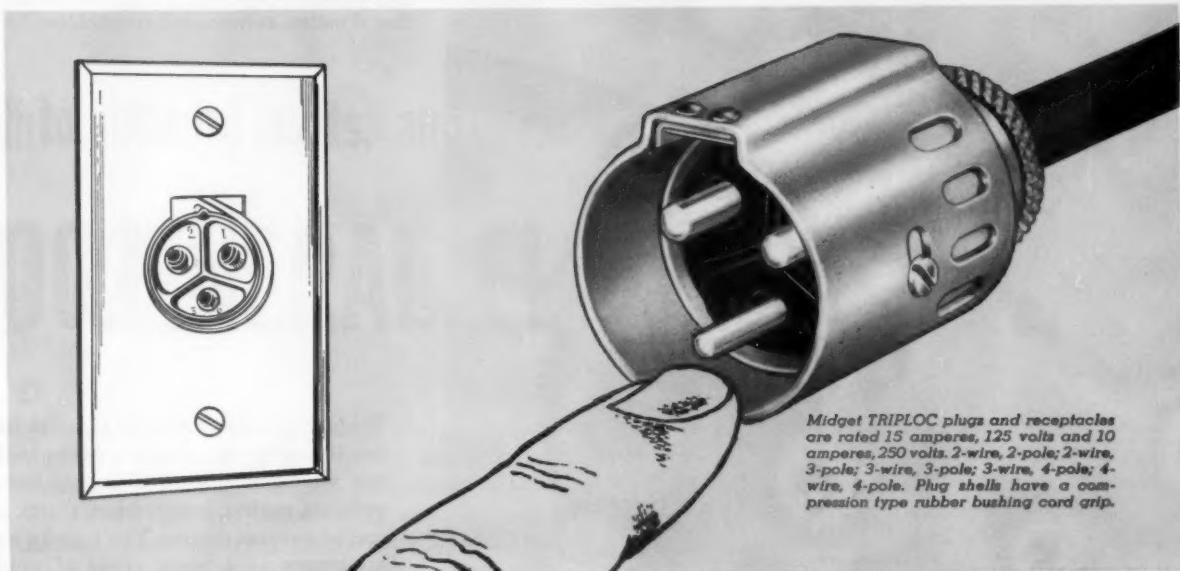


MICHIGAN CONTRACTORS Victor P. Sarin (left), Detroit; and E. A. Keidel, Modern Electric Co., Mt. Clemens, take time out during National Adequate Wiring Conference in Chicago to check session agenda.

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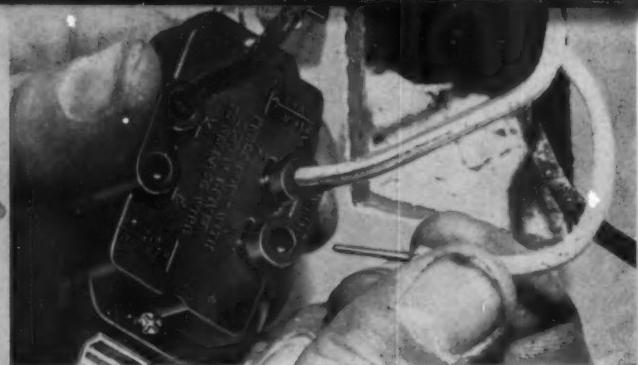
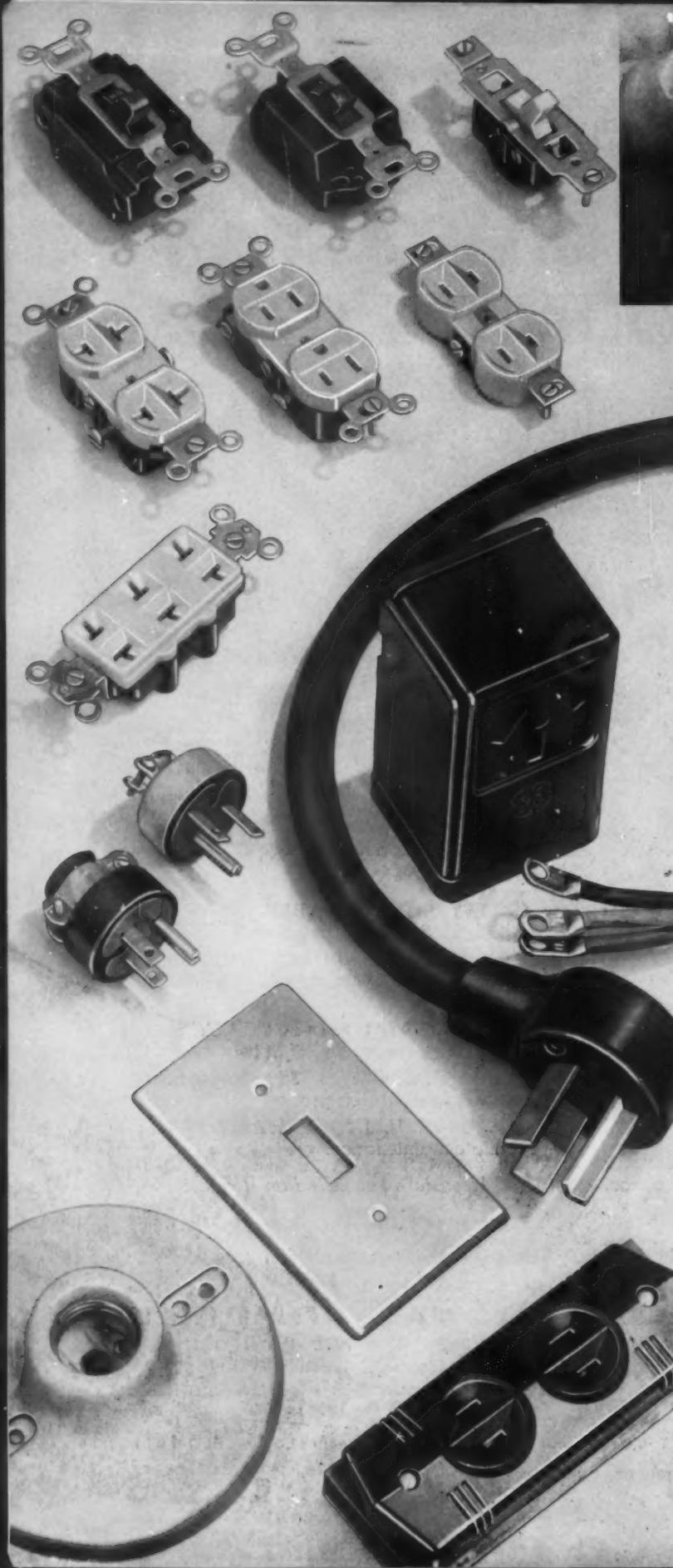
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PLUGS AND RECEPTACLES • CIRCUIT CONTROLS • LIGHTING FIXTURES • FLOODLIGHTS

ELECTRICAL CONSTRUCTION AND MAINTENANCE . . . APRIL, 1955



G-E PRESSURE-LOCK TERMINALS make wiring easy, eliminate binding screws. Wire is merely stripped and pushed into terminal for firm, dependable pressure connection. Available in a complete line of outlets, switches, and lampholders.

For breadth of line,

LOOK

With the newly expanded General Electric line of wiring devices you can handle any wiring job. Look over this line of switches, outlets, lampholders, plates, and special purpose devices. You'll find a wide assortment in a broad range of grades, from the finest specification and heavy duty grades to the low cost competitive grades. Here's everything needed for commercial and industrial jobs; for residential and rural jobs.

During 1954 alone the line grew by the development and introduction of 102 new products, and the redesign and improvement of 47 additional items. A completely new double outlet line was developed — smart looking in appearance, sturdy in design, and offering exclusive features. Other developments included a new line of grounding outlets and caps, an AC switch line, higher-rated mercury switches, several new remote control components, improved range outlets and cords, and a new line of dryer outlets and cords.

Yes, you can look to General Electric for more new developments in 1955 . . . wiring devices that not only answer the electrical contractor's needs, but can be depended on for extra service and long life.



NEW G-E MERCURY SWITCH has a handle lighted by a tiny neon lamp. Handle lights when switch is in OFF position. Will give years of service. Locates switch in dark and serves as a pilot light.



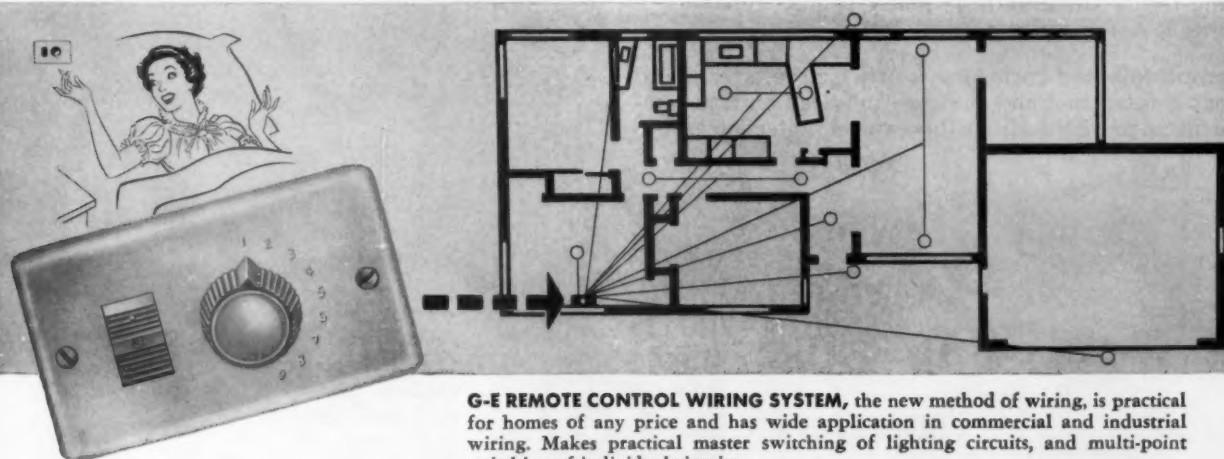
G-E WATCH DOG STARTERS provide automatic lockout of failing lamps, protect ballast and fixture wiring, and eliminate blinking — outlast ordinary starters up to ten to one.

product developments, and quality . . .

TO GENERAL ELECTRIC

Extensive as the G-E wiring device line is, General Electric is constantly developing new products and new ideas. Some improvements are designed to save installation time and make wiring easy: like self-tapping, plaster-cleaning screws (now standard on all switches and outlets) held in position for quick mounting by fiber washers. Some G-E developments

improve the wiring system: with remote control, the convenience of multi-point and master switching is offered along with the safety of low voltage. Always, General Electric developments serve the contractor and his customers dependably and at low cost. Wiring Device Department, General Electric Company, Providence 7, Rhode Island.



G-E REMOTE CONTROL WIRING SYSTEM, the new method of wiring, is practical for homes of any price and has wide application in commercial and industrial wiring. Makes practical master switching of lighting circuits, and multi-point switching of individual circuits.

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in ONE
Compact Unit

THE Allis-Chalmers Type H high voltage starter is a complete control unit. Everything needed for efficient motor control and positive protection is engineered into one easy-to-install cubicle.

Control functions, varying with specific job applications, include full or reduced-voltage starting, acceleration, speed control, reversing or non-reversing, and dynamic braking.

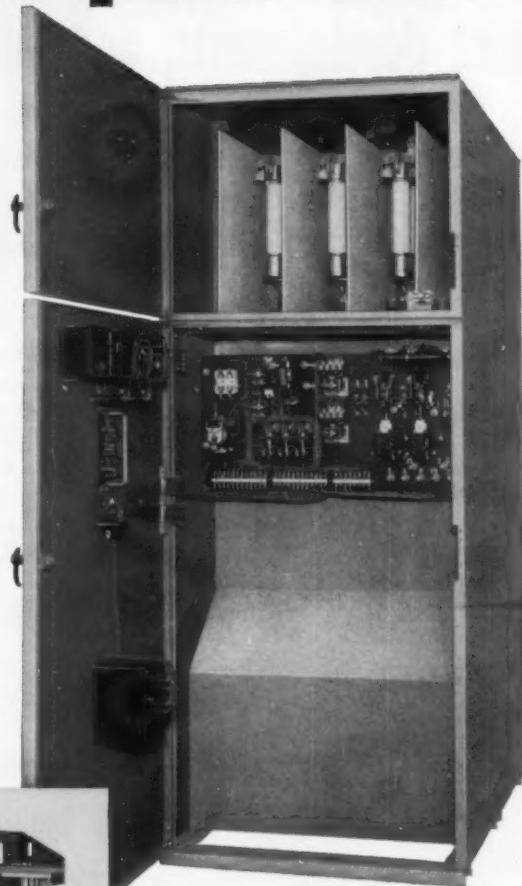
A few of the many protective features

Current-Limiting Fuses clear short circuit in less than $\frac{1}{2}$ cycle... long before short can damage contactor or motor.

Overload Thermal Relay adjusts for ambient temperatures . . . trips only on motor overload. Allows use of maximum capacity.

Time-Delay Undervoltage Relay permits restarting if power is restored within its setting.

Compartmented Enclosures isolate high voltages. Dead front construction and electrical interlock on fuse compartment provide additional personnel protection.



For complete information, see your Allis-Chalmers representative, or write Allis-Chalmers, Milwaukee 1, Wisconsin. Ask for Bulletin 14B6410B.

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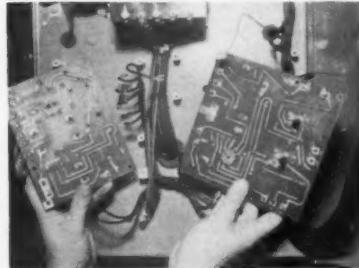
Product News



Room Air Conditioner (1)

Builder's Model low-priced built-in room air conditioner fits into wall snugly. Nearly flush, ductless design eliminates overhang inside or outside house. Only 15-in. deep, 14-in. high and 32-in. wide, unit is inserted in opening under window, and may be had in various capacities.

Tyvel Mfg. Corp., 5702 First Ave., Brooklyn 19, N. Y.



Control (2)

Printed circuits and simplified control system are features of new line of full-wave Thy-mo-trol electronic adjustable-speed drives, available at prices 20% lower than previous models of same type. Panels are current-carrying diagrams and may be visibly inspected, while maintenance is greatly reduced. New design is available in ratings from $\frac{3}{4}$ -1 and $1\frac{1}{2}$ -3-hp full-wave. Controls give stepless speed control from ac power source over an 8:1 speed range, with higher ranges available for special applications.

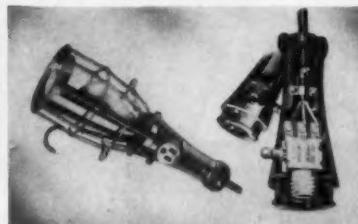
General Electric Co., Schenectady 5, N. Y.

High-Voltage Lamp (3)

New 750-w R-52 high-voltage lamp designed for use in high-bay industrial areas is available for 230-250-v electrical systems. Like the companion 500-w lamp, this lamp provides high-intensity down-

light and collects minimum dust and dirt on its bottom surface. Lamp data includes mogul screw mechanical base, 2000-hr. life, and base-up burning position.

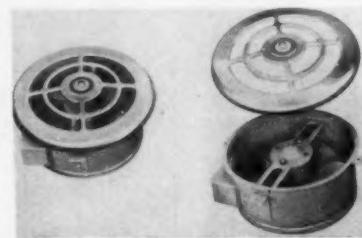
General Electric Co., Nela Park, Cleveland 12, Ohio.



Portable Lamp Guards (4)

A 3-wire convenience outlet in the handle of a new portable lamp guard provides method of grounding power tools. The outlet is designed to receive caps having 2 parallel heads and a U-shaped third blade for ground. The cage is grounded by means of internal handle construction which provides contact with the attached cord. Guards are available with either the standard closed end reflector cage or with an open end cage, having a concentrating end lens and rotating reflector which enables light to be beamed to otherwise inaccessible areas. Phenolic handle is equipped with Levolor switch. The complete assembly is designed to resist oils, gases, flame, moisture, abrasion and some acids. The 3-wire handle is also available without convenience outlet, the lamp guard alone being grounded.

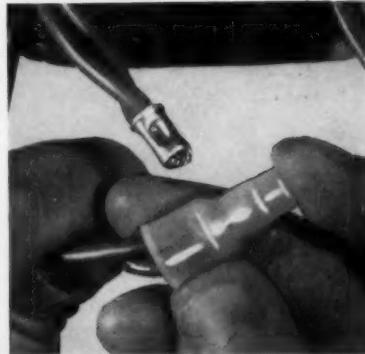
McGill Manufacturing Co., Inc., Valparaiso, Ind.



Ventilating Fan (5)

New 9- and 11-inch ventilating fans for complete ventilation of bath, kitchen and utility rooms. Features include laboratory-tested snap-in motor, balanced, vibration-free 5-blade, pressure-type fans, and highly polished chrome grille. Motor and fan are installed in special hanger housing.

Norris-Thermador Corp., 5215 S. Boyle Ave., Los Angeles 58, Calif.



Splice Connector (6)

New crimp-type splicing connector with white snap-on Nylon insulating caps. Two connector sizes take wire sizes of 2 No. 18 to 4 No. 12 and 3 No. 12 to 2 No. 6, covering the full range of fixture and branch circuit connections. A copper cylinder is applied to the twisted splice and crimped with a special 4-way crimping tool, any extending wire ends being clipped off. Turned-in teeth around the inner circumference of the insulating cap slide down along the copper cylinder as the cap is inserted, then spring inward as they pass the lower edge. This locks the insulator permanently in place.

Buchanan Electrical Products Corp., 237 U.S. Route 22, Hillside, N. J.



Trans-Lighted Ceiling (7)

Luma-Ceiling is combination of white translucent corrugated vinyl supported on extruded aluminum channels, combined with standard fluorescent or slimline strips. Auxiliary spun-glass acoustical baffles have high sound-absorption coefficient. Ceiling comes packaged with all necessary components.

Pittsburgh Reflector Co., 410 Oliver Bldg., Pittsburgh 22, Pa.

45° ANGLE

CONNECTOR

NEW midwest ANGLE CONNECTORS

APPLICATION

45° and 90° angle connectors for non-metallic cable, armored cable, flexible steel conduit. Connectors are two-screw, hinged cap; are designed for neat and quicker installations for O.E.M. as well as regular trade applications.

★ ENGINEERING

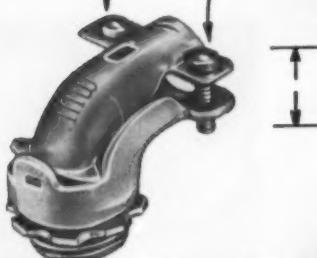
These fittings are designed with a screw on each side of the opening to provide a secure grip on the cable. Screws are of sufficient length to permit cable to be installed without removing cap.

MATERIAL

Connectors are made with a malleable iron body, formed steel cap and locknut; thoroughly cadmium plated for protection against corrosion.

SIZE

Connectors are standard trade size 3/8", for 1/2" threaded hub or knockout. Minimum and maximum openings for cable are 3/8" and 21/32".



90° ANGLE CONNECTOR

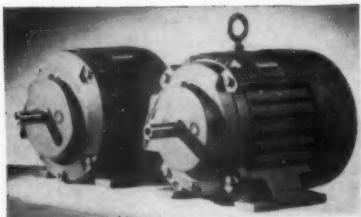
Here is another Midwest development in providing quality fittings. "Quality" is just a condensed way of saying: "Getting the total job done—right—with the most inexpensive combination of material and man hours." Engineering and producing quality fittings to meet the highest standards of electrical wiring installations, is our objective at Midwest.



Midwest Electric Mfg. Company

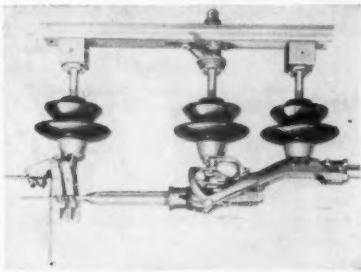
MANUFACTURERS OF ELECTRICAL WIRING PRODUCTS

1639 W. WALNUT STREET
Chicago 12, Illinois

**AC Motor****(8)**

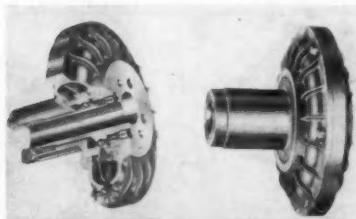
New line of totally-protected ac motors offers complete protection against dripping, splashing and falling objects, regardless of mounting position. Ventilation louvers are positioned high in end brackets to afford maximum protection. New neoprene gaskets afford a positive seal between frame and conduit box; gaskets have indexed pressure knobs to hold each lead securely. Conduit boxes can be positioned in any of the 4 quadrants for ease of installation. Three types are available: fan-cooled, corrosion-proof or explosion-proof.

Reliance Electric & Engineering Co., 1088 Ivanhoe Rd., Cleveland 10, Ohio.

**Disconnect Switch****(9)**

New 1200-amp outdoor group-operated vertical-break disconnect rated 7.5 through 69-kv features silver-to-silver high-pressure contacts, sealed lifetime bearings and moving joints, rotating switch blades, fewer number of current interchange points and adjustable terminal clamps. Designed for either pole or structure mounting in a horizontal, vertical or inverted position, switch is adaptable for many sectionalizing, disconnecting and by-passing applications.

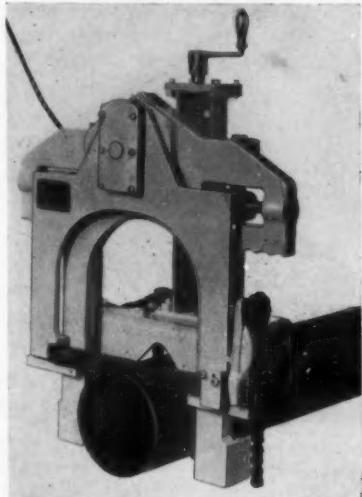
Line Material Co., Milwaukee 1, Wis.

**Dry Fluid Drive****(10)**

New drive for industrial power transmission, called Flexidyne, handles difficult starting and reversing problems and gives protection against shocks and overloads. Major advantage is that it does

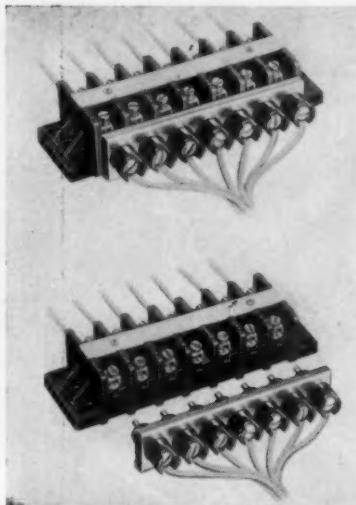
not slip at normal operating speeds, but it is slippage which gives protection in case of overloads. Three major components are the housing, which is connected to the driving motor, a rotor which turns within the housing and is connected to the load to be driven, and a "flow charge"—fine particles of spherical steel shot which act very much like a fluid. When housing begins turning, flow charge within the housing is thrown to the circumference of the housing and is compressed by centrifugal force. The friction and wedging action of the charge against the rotor causes the rotor to be turned. The amount of charge determines the torque capacity and may be varied readily to suit the need. Two lines are available: Flexidyne Drives for direct mounting to motor shafts, and Flexidyne Couplings for straight line drive. Initial drives available are rated at 3 to 30 hp at 1800 rpm.

Dodge Manufacturing Corp., Mishawaka, Ind.

**Power Hacksaw****(11)**

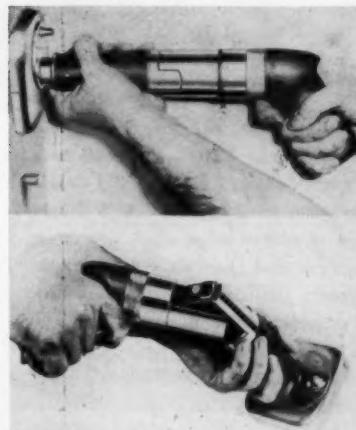
A new clamp-on portable power hack saw, known as the Wachs Guillotine Pipe Saw, can be used for field cutting of iron and steel pipe, bar stock and beams. The unit, which can do the job of former hand cutting in a matter of minutes, reportedly cuts through a 6-in. standard wall steel pipe in 8 minutes, 6-in. cast pipe in 4 minutes. Cutting time depends on pipe characteristics. The 120-pound saw is 28 inches high, operates in a 25-inch wide space; has an aluminum frame, steel cutting bow and steel saddle; is powered by an electric or air motor. A chain pipe vise clamps unit to pipe in a few seconds. An accurately machined steel V base gives positive grip and perfect alignment to assure right-angle cuts on pipe. Unit has a high speed, 12-inch steel blade with a 2-inch stroke and a manual finger-tip pressure feed to adjust cutting speeds to all materials. Blade is lifted from cut on return stroke to extend blade life.

The E. H. Wachs Company, 1525 North Dayton Street, Chicago 22, Illinois.

**Terminal Blocks****(12)**

Combination of RH and FTLP (feed-thru long pin) blocks provides high-pressure solderless anchoring for connectors, offers convenient identification of circuits and permits multiple contacts at low cost. FTLP block may be had in any specified number of terminals from 1 to 16, and blocks may be mounted side by side where a connect and disconnect feature is required on terminal blocks with more than 16 terminals. RH block is assembled in any number of terminals from 1 to 20.

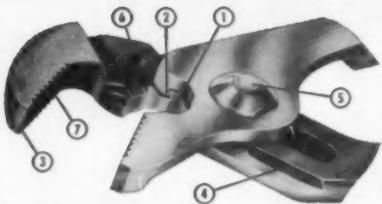
Curtis Development & Mfg. Co., 3266 N. 33rd St., Milwaukee 16, Wis.

**Powder-Powered Tool****(13)**

High-power light-weight Creary Drive-It 330 is less than 6 lbs and only 13 in. in length. Uses .25 or .38 caliber drive shells and features snap-open breach action with automatic cartridge extractor, molded rubber pistol grip and chromium finished housing. Assembly of 3 sections makes field-strip cleaning easy. The 330 unit uses 56 different sizes and kinds of drive pins.

Powder Power Tool Corp., 7527 S.W. Macadam Ave., Portland, Ore.

Every electrician needs...



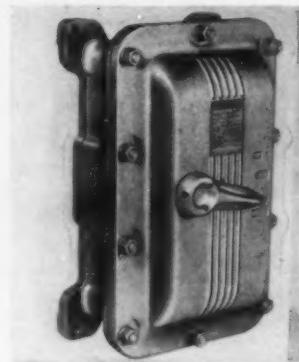
here's why

1. Interlocking principle prevents slipping under any load.
2. New type wide base lugs cannot shear.
3. New nose design for gripping small objects.
4. Patented design of tension edge eliminates stress concentration at channels.
5. Interlocking design minimizes stress on joint bolt.
6. Precision machined interlocking surfaces result in perfect fit, distributing pressure evenly.
7. "Rite Angle" teeth guarantee maximum bite and minimum wear.

Look for the Channellock line when you're shopping for hand tools. Channellock pliers offer features that you can't get with other makes. And when you buy a Channellock plier, ask to see the full line—you'll find a style and model to do any job better.



THE PLIER DESIGN THAT OBSOLETES ALL OTHERS
CHAMPION DEARMONT TOOL CO. • MEADVILLE, PA.



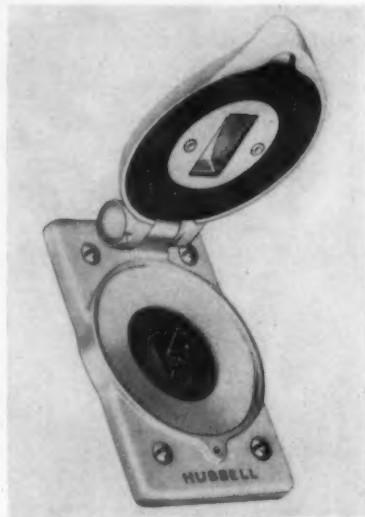
Breaker Enclosure (14)

New nodular cast iron enclosures for AB-I circuit breakers in hazardous locations. Wide machine-ground flanges and close-fitting operating handle mechanism prevent internal arcs from igniting explosive or combustible atmospheres. The 7 enclosure is offered for NEMA Class I, Groups C and D locations where potentially explosive vapors are present. Available in standard ratings between 15 and 100 amps, the new enclosures can be equipped with all conventional accessories.

Westinghouse Electric Corp., P. O. Box 2099, Pittsburgh 30, Pa.

of air circulation within the room; flush mounting in addition to flexible mounting permits installation any distance from 6 to 18 inches into room. Control center is concealed behind hinged front door. Folder X7921 available.

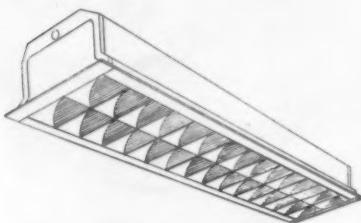
Emerson Electric Mfg. Co., 8100 Florissant Ave., St. Louis 21, Mo.



Weatherproof Plate (17)

New weatherproof plate features recessed cover to accept toggle switches. Unit is supplied with fibre insulating disc, allowing installation of toggle or lock-type switches and, by removing disc or knockouts in it, 2, 3 and 4-wire 20-amp twist-lock receptacles can be utilized. Cover snaps shut when cap is withdrawn, while added ridge in cover improves seal cover.

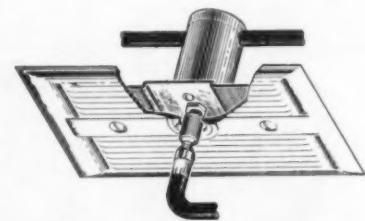
Harvey Hubbell, Inc., Bridgeport, Conn.



Louver

A new type of low-brightness louver ("RO-LO-B") developed for use with Lite-Blox recessed troffers. The parflector with cross-baffles provides 35° crosswise and 25° lengthwise lamp-shielding. They were made of No. 1 reflector aluminum and finished with Alzak after forming. The entire "Center V" and cross-baffle assembly may be removed. The assembly is supported on chains for easy relamping. Available for two 40-watt conventional, rapid-start and slimline operation or for two 75-watt slimline.

Edwin F. Guth Company, 2615 Washington Blvd., St. Louis, Mo.



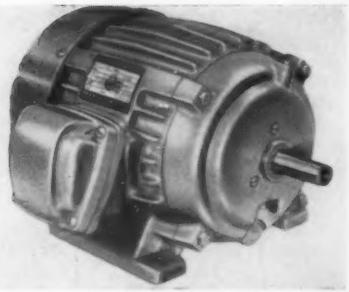
TV Cable Tapoffs (18)

Model MTO-11 tapoff for community systems and Model MTO-59 for indoor use feature air dielectric insulation to minimize shunt capacitance. Weatherproof MTO-11 handles RG-11/U thru line, with a clamp for messenger cable and RG-59/U fittings for the tapoff line. MTO-59 taps into RG-59/U for TV outlets in motels, hotels, apartments and other multiple-dwelling structures. Wall outlet plate and receptacle included.

Blonder-Tongue Laboratories Inc., 526 North Ave., Westfield, N. J.

Room Air Conditioner (16)

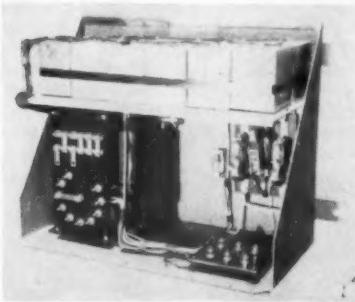
New line of room air conditioners including $\frac{3}{4}$ -ton and 1-ton units with cooling capacities of 8,000 and 11,500 Btu/hr. Automatic operation by a closely controlled thermostat is standard on 1-ton, optional on $\frac{3}{4}$ -ton models. Five separate adjustable louvers permit variation



Explosion-Proof Motor (19)

New NEMA-spec motor, designated type E, is made in ratings from 1-5 hp. Made for Class I Group D service (inflammable gasses and volatile liquids) and Class II Groups F and G use (combustible dusts), motor is fully enclosed and equipped with sparkproof aluminum fan, sealed conduit box, extended internal bearing caps, rabbeted register, one-piece solid frame and drain plug.

U. S. Electrical Motors, Inc., Box 2058, Los Angeles 54, Calif.



Power Converter (20)

New power converter gives 3-phase power from single-phase lighting service. Designed for Types 2S, 2SA and 2SAC 3-phase, 60-cycle, 220-volt motors in eleven sizes. Called Add-A-Phase, it is a static phase converter providing three 120-degree phases, permitting the use of single or double squirrel cage, variable speed and 2-speed 3-phase motors on single phase 240-volt service. Built in three models: 150% torque, 200% torque, and special high torque for air conditioning. Bulletin available.

System Analyzer Corp., 700 W. State St., Nokomis, Ill.

Solenoid Valve (21)

New direct lift, solenoid-operated, packless valve, designed for low-pressure application up to 7 psi in $\frac{3}{8}$ -inch and $\frac{1}{2}$ -inch pipe sizes. Requiring only 10 watts to operate, the normally closed valve can be used to control air, gas, propane, butane, water, gasoline, light fuel oil and other fluids to 180°F. Available for Class I, Group D and Class II, Groups E, F & G.

Automatic Switch Co., 391 Lakeside Ave., Orange, N. J.

WHY



**settle for an
ordinary
voltage tester?**

Ask yourself these questions	The Amprobe Jr.	ordinary voltage tester
Does it measure current as well as voltage?	YES	NO
Does it give you full visibility on a graduated reading scale?	YES	NO
Does it fit conveniently in your pocket?	YES	YES
Does it measure within $\pm 3\%$ accuracy?	YES	NO
Does it come in a full line of models to meet different problems?	YES	NO
Does it protect you against shorts and shocks?	YES	YES
Does it balance loads, locate grounds, determine motor overloads, check rating of circuit breakers?	YES	NO

Send For Free Service Bulletin

Pyramid Instrument Corp.
Dept. M-45, Lynbrook, N. Y.
Please send me the Amprobe service bulletins checked below:

- How to cut costs and land more jobs
- Trouble-shooting electric motors
- How to boost service profits
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COMPANY _____

ADDRESS _____

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Amprobe Jr.®
snap-around volt-amp tester **\$19.85**

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**Fire Alarm Systems
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Signal Devices



Code Call Systems

Write for
Catalogs FSC-3

SLOTTED-NECK construction means cooler lamps—no dirt accumulation — more up-light, less maintenance—better illumination — longer fixture life.

A BOLITE REFLECTORS

*Provide Cooler,
Cleaner Light*

ALL-WHITE ABOLITE reflectors are whiter-than-white, outside as well as inside. They give better illumination, and provide for modern efficient plant appearance.



All ABOLITE reflectors feature lifetime enamel permanently bonded to heavy gauge steel. These reflectors are unaffected by weathering, they will not rust, stain or discolor, resist accumulation of dirt and grime, and result in longer fixture life.

ABOLITE LIGHTING DIVISION
The Jones Metal Products Co.
West Lafayette, Ohio



At no extra cost ALL-WHITE finish SLOTTED-NECK construction can be furnished for all ABOLITE reflectors. SLOTTED-NECK ALL-WHITE features are original ABOLITE developments.

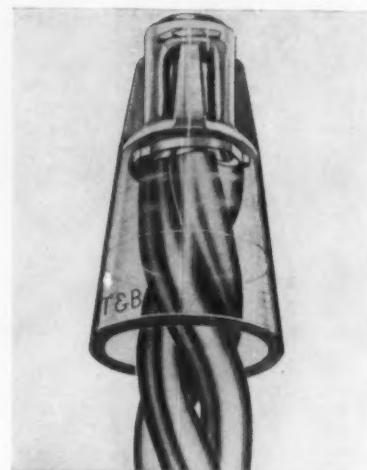


You can expect complete reliability from products engineered and manufactured by Signal Engineering & Mfg. Company, originators of A-C Fire Alarm Systems and the Underdome Bell. Some of the SIGNAL products of special interest to the building industry are:

Interior Fire Alarm Systems (coded and non-coded types) complete with wall boxes, control panels and signal devices

Single-stroke and vibrating bells in various sizes; chimes, cow bells and horns

Code Call Systems for instant communication with individuals away from desks or benches.

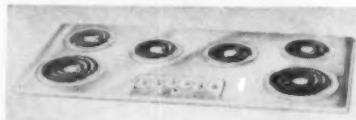


Pigtail Connector

(22)

New connector accommodates combinations of solid or stranded conductors up to three No. 12 AWG maximum, and is installed rapidly with standard Sta-kon tools. U. L. approved, the connector has a plastic insulating cap that permits quick visual inspection of the joint through the transparent plastic. Molded of tough, lightweight, high dielectric strength plastic, the insulating cap has external ribs for convenient gripping with the fingers. Connectors come in special kit consisting of plastic box, Sta-kon plus pliers, and connectors.

The Thomas & Betts Co., Elizabeth, N. J.



Built-In Range

(23)

Two new cooking tops with 6 units are available either with all six fast-heat monoblock units (SU-6B) or with 5 surface units and a convertible duo-cook for top-of-range or deep-well use (SU-6AN). Both models feature 7-heat switch control, removable easy-to-clean drip pans, on-off light and stainless-steel satin-finish tops.

Norris-Thermador Corp., 5215 S. Boyle Ave., Los Angeles 58, Cal.

Door Operator

(24)

New Auto Magic door operator will open, close, and lock garage door and turn on or off the garage lights from the automobile. Two models are available: an electronic remote-controlled unit wherein a small radio transmitter under the hood of the car is operated from a dashboard button, and a pushbutton or key lock-switch model which is actuated by a control mounted on a gate or light post.

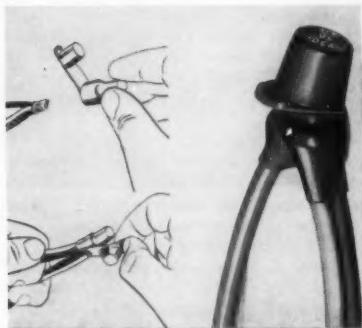
Auto-Magic Div., United States Motors Corp., Oshkosh, Wis.

Ground Clamp

(25)

Clamps designed to insure positive grounding for use with rigid conduit, EMT and armored ground wire have been announced. This "static preventive" clamp is made of malleable iron, hot dip galvanized in all standard sizes from $\frac{1}{2}$ inch to 8 inches. Allen screws secured with lockwashers are furnished. Terminals accommodate 8, 6 or 4 bare or insulated ground wire. Clamps are suited for use in steel, chemical, paper or other industries where static electricity is a problem.

Gedney Electric Co., RKO Bldg., Radio City, New York 20, N. Y.



Crimp Connector

(26)

A new crimp-type wire connector with a "Wrap-Cap" insulator. It has two parts—the sleeve and patented insulating cap. Both parts are listed by Underwriters' Laboratories, Inc. for general use for branch circuits and fixture wiring. The "Wrap-Cap" insulator is made of the same type of flexible vinyl material used for TW wire and is impervious to aging, corrosive atmospheres, sunlight, gasoline, etc. The crimp sleeve is made of cadmium plated steel. It is open at both ends to allow visual observation at the joint.

Ideal Industries, Inc., Sycamore, Ill.

Room Conditioners

(27)

A 1955 line of 24 models of room air conditioners, including a new extra capacity $1\frac{1}{2}$ -hp model, has been announced. These are window units which have air cooled condensers, designed for installation in walls, transoms and windows, in factories, offices and retail establishments, as well as in the home. There are eight different styles, 24 models, with such features as thermostat control, comfort director grilles and easy filter removal. The new line includes $\frac{1}{6}$ hp, $\frac{1}{2}$ hp, $\frac{3}{4}$ hp, 1 hp and $1\frac{1}{2}$ hp models. A wide range of stylings are available with the many models. The line includes console as well as window units.

York Corporation, York, Pa.

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ALUMINUM COMPANY OF AMERICA

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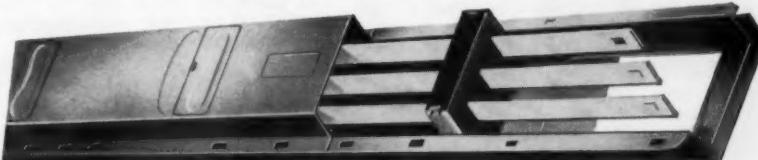
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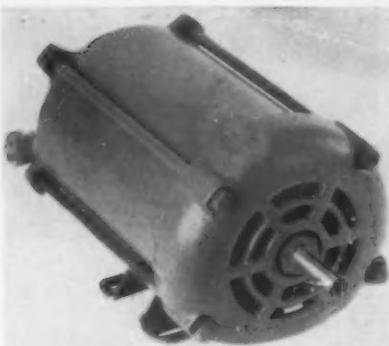
Company _____

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New Alcoa Aluminum Bus Conductor makes bus systems stronger, lighter; cuts costs! Bus systems using Alcoa's new No. 2 EC bus bar provide the best combination of strength, light weight and conductivity at a saving of up to 10%. Specify Alcoa Aluminum Bus Conductor.





Explosion-Proof Motor (28)

Fractional hp motor designed for safe operation in hazardous atmospheres plus minimum maintenance is constructed with heavy cast iron end shields and uses new ball-bearing grease highly resistant to oxidation and moisture. It is approved for Class I Group D, and Class II Groups E, F and G atmospheres.

General Electric Co., Schenectady 5, N. Y.



Frequency Meters (29)

New line of 3½-in. flush panel mounting vibrating reed frequency meters are direct-reading and consist of steel reeds accurately tuned. Made in 3 styles of cases (molded bakelite, metal and hermetically sealed), meters come with variety of reeds for 25, 50, 60 and 400 cycles. Other ranges from 15-1500 cycles. Bulletin 805 is available for full description.

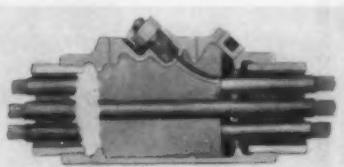
Herman H. Sticht Co., Inc., 27 Park Pl., New York, N. Y.

Two-Way Radio (30)

A complete new line of FM mobile and base station two-way radio communication equipment for both 25-54 megacycle and 144-174 megacycle land-mobile radio services. The new line has been designed, from microphone to speaker, to cover the wide requirements of land-mobile radio services. Featuring the use of plug-in chassis, the new "Progress Line" was designed around twelve basic "building blocks" of standardized physical dimensions.

Chassis for transmitters, receivers and power supplies are interchangeable with other units of the same types mounted in a base station or mobile housing. New housings are dust-proof and have drawer-type construction with lift up covers.

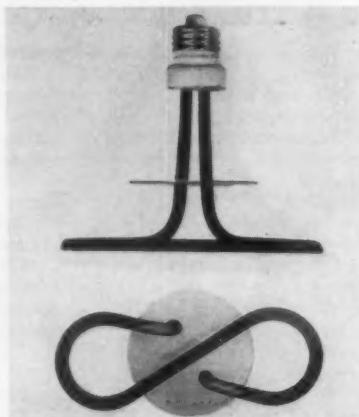
General Electric Company, Electronics Park, Syracuse, N. Y.



Conduit Fittings (31)

Similar in function to type EZD sealing condulets but without removable inspection cover, new explosion-proof sealing conduit type EYD is available in larger hub sizes from ½-6-in. in 2 different styles. Damming and filling the seal interior is simple process, since rubber tubing and copper wire are furnished with each fitting for that purpose. Tubing with wire inserted is placed up through drain opening; sealing compound is poured into chamber; wire and flexible rubber core are removed after compound hardens, and drain path is left.

Crouse-Hinds Co., Wolf & 7th North Sts., Syracuse, New York.



Infrared Heater (33)

A new-type, all-metal far-infrared electric heater for industrial baking, drying, curing and dehydrating. One type has standard medium screw base; second type has bi-post terminals. Both are sheathed in Iconel and may be used to replace glass infrared lamps. Heaters may be "cycled" or "pulsed" using inexpensive input controller to suit radiation to conveyor speed or size of work. Wavelengths produced are absorbed by all colors with practically equal speed. Insulated elements burn off any splashed liquids and other materials, reducing maintenance. Available in ratings from 375 to 1200 watts for 120- and 240-volt operation.

The Edwin L. Wiegand Co., 7500 Thomas Blvd., Pittsburgh 8, Pa.



Portable Vise Stand (32)

New portable vise stand serves as on-the-job work bench for the pipe fitter. Stand sets up or takes down quickly, being all one unit with no loose parts. Built-in tray pushes up and folds for easy carrying and compactness. Light in weight for portability, stand is sturdy and won't fold up in use. It requires little space on truck or in storage between jobs. Features include large size vise base for easy mounting of vise, 3 pipe benders, several tool slots, pipe rest and ceiling brace.

Toledo Pipe Threading Machine Co., Toledo, Ohio.



Portable Saw (34)

A new portable band saw has been developed to provide a high degree of mobility. The unit is of all-steel construction, mounted on large size (12 inch) rubber tired wheels and can be easily moved by one man. Comparatively light, it can be wheeled to the stock rather than requiring the stock to be brought to it. It is capable of handling on the job 5-inch rounds and 10-inch flats, eliminating hand cutting of structural steel, pipe, conduit, angle iron, reinforcing rods, etc. Locks are provided for machine during transit, and the front leg has storage compartment for extra blades. Unit is 30 inches high when closed.

Johnson Mfg. Co., Albion, Mich.

G.E. gives you 50% more ballast life by designing 10% cooler than industry standards



AVERAGE BALLAST LIFE
WITH G.E. DESIGN STANDARD



BECAUSE G-E BALLASTS ARE engineered to operate 10% cooler than industry standards, they offer 50% longer life in your fluorescent

installation. With this chart, Flora shows you the extra ballast life you get when you specify General Electric's cooler operating ballasts.

Flora* shows you why . . .

General Electric Ballasts Last 50% Longer, Help You Save Lighting Dollars

Every G-E ballast is designed to operate 10% cooler than industry standards; the chart above shows that this means 50% longer ballast life! To you, this means longer life for your fluorescent installations and a real saving in lighting dollars.

By carefully filling each ballast with a special heat-conducting compound, and by using larger wire size in the coil windings than would be required simply to meet industry standards, G.E.

builds ballasts that operate cooler! Cooler operating temperatures combined with the use of unusually strong insulating materials results in years of added ballast life.

These special G-E techniques contribute toward lower operating temperatures, resulting in 50% longer ballast life.

Next time you specify equipment for a fluorescent lighting installation, make

sure you get the best . . . specify General Electric longer-life ballasts.

A G-E ballast tag or sticker on your fixture is proof that it's equipped with a superior ballast; G-E ballasts in your installation mean better, more efficient lighting, more economical operation. For further information on G-E ballasts, write Section 401-10, General Electric Company, Schenectady 5, New York.

*Miss Fluorescent Ballast, G.E.'s Ballast Mascot
Copyright 1955, General Electric Company



G-E BALLASTS ARE constantly spot-checked for normal or abnormal temperature rise in this special lab. Close control of temperature rise helps assure 50% longer G-E ballast life.

Five more reasons why GENERAL ELECTRIC IS YOUR BEST BALLAST VALUE

- EXCLUSIVE SOUND RATING SYSTEM
- SUPERIOR QUALITY CONTROL
- PRECISE LAMP-MATCHED DESIGN
- PROVED PRODUCT LEADERSHIP
- COMPLETE CUSTOMER SERVICES



Progress Is Our Most Important Product

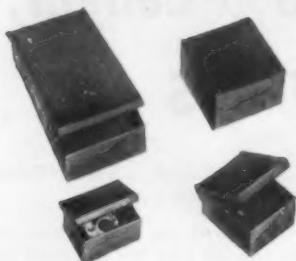
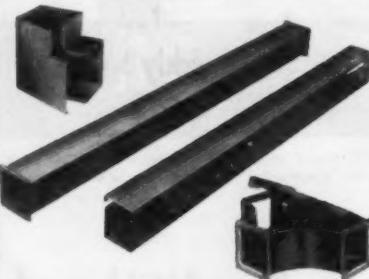
GENERAL  **ELECTRIC**

You can get **WHAT** you want WHEN you want it from the



SERVICE is the "keynote" at Keystone! And one good example is the fact that *every* item in the complete Keystone Line is stocked for *immediate shipment* . . . direct to you . . . to or through your local electrical distributor. No delays on the job, no partial deliveries! You'll find, too, that every item is priced right . . . quality-built to save time, reduce costs, increase your profits per job!

KEYSTONE WIREWAYS and Auxiliary Fittings have all the time-saving, money-saving features your customers want. They're quickly, easily installed, readily adaptable to any power distribution system. Available, too, in both flanged and flangeless styles and a wide range of sizes and lengths . . . from $2\frac{1}{2}$ " x $2\frac{1}{2}$ " x 1 ft. through 8" x 8" x 5 feet long.



KEYSTONE CUTOUT BOXES and Pull Boxes are furnished in Type "A" with hinged cover, Type "SC" with screw cover. Both feature a formed construction strongly fabricated and securely welded . . . with adequate, easily removable knockouts. And both types are available in a complete range of sizes . . . stocked for prompt delivery to meet your needs.

KEYSTONE SWITCH BOXES and Outlet Boxes are loaded with extra quality features! BX or Romex clamps are already assembled with nested fit for easy pulling of wires. Knockouts and pri-outs come out double quick. And tapped holes are extruded to provide extra thickness, eliminate stripping of threads. Even mounting brackets make installation easier.



See us at Booth No. 123 N.A.E.D. 47th Annual Convention Conrad Hilton Hotel—Chicago, May 22nd through 25th.



KEYSTONE MANUFACTURING COMPANY

23328 SHERWOOD AVENUE • CENTER LINE (Detroit) MICHIGAN

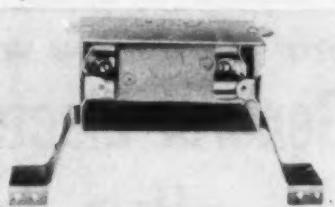
...the Complete Line of Wiring Installation Equipment
Sold Only through recognized Electrical Distributors



Fluorescent Luminaire (35)

New semi-indirect Sky/Lume utilizes a one-piece wrap-around styrene basket, hinged and easily removable from either side. Low brightness contrast ratio is obtained by 75% uplight and 25% down-light, the styrene bottom having a transmission factor of 15%. One-piece die-formed and welded 20-gauge steel channel is constructed to provide continuous wireway for interconnected units. Provision is made for the installation of a fusetron fuse which isolates fixture against thermal and electrical overload. Available in 2, 3, and 4-lamp, 2-foot Trigger Start units; 40-watt, 4- and 8-ft tandem Rapid Start; 2, 3 and 4-lamp 4- and 8-ft slimline units; standard starter type fluorescent. Higher transmission factors available for surface mounting.

Electro Silv-A-King Corp., 1535 S. Paulina St., Chicago 8, Ill.



Switch Boxes (36)

New switch box features twin mounting brackets for faster and easier installation on structural members and studding. Designed for use with non-metallic sheathed cable and flexible tubing, the 4 by 2 by 2 box provides greater conductor space, while clamps with nested fit are also provided to facilitate wire pulling.

Keystone Manufacturing Co., 23328 Sherwood Rd., Center Line (Detroit), Mich.

Circuit Breakers (37)

New magnetic air circuit breakers for use on 120/208, 240 and 480 volts ac have been developed with greatly increased (25% to 50%) interrupting ratings. This increase in the ratings of air circuit breakers of the AK line has been established by tests which show that the multi-slot interrupter used in the units is capable of handling the current. This development affords a considerable reduction in price for breakers applied in cascade under the new ratings as compared to the former ratings. No change is being made in the ratings at 600 volts ac and 250 volts dc.

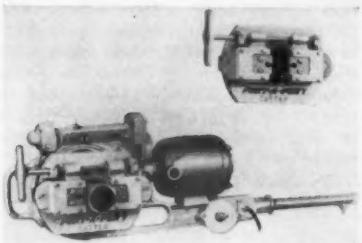
General Electric Co., Schenectady 5, N. Y.

Built-In Bushing

(38)

New Insuline bushings designed for rigid, EMT and flexible raceways are to be built into ends of raceways, protect wire insulation from damage and reduce up to 50% the effort required to pull wire. Colored bright blue for easy identification, these bushings prevent the wire from coming into contact with the metal of the raceway at the outlet. The plastic bushings are assembled integral with the connector bodies, resist corrosion, and have high impact strength. Listed by Underwriters' Laboratories.

The Thomas & Betts Co., 36 Butler St., Elizabeth 1, N. J.



Pipe Cutter

(39)

New 12-lb pipe cutter is an accessory for the Port-A-Pony power pipe threader, enabling unit to cut $\frac{1}{2}$ - to 3-inch pipe in 30 seconds. Spring-fed knives give constant controlled pressure. One set of cutting knives are included with unit; grooving and beveling knives are also available. Safety guide prevents gouging and burring, assuring a clean cut.

Thread-Ezy Manufacturing Co., Cornna, Mich.



Residential Lighting

(40)

A newly designed circular fluorescent luminaire, for 1 or 2 lamps, has been specially styled to complement modern homes. These units are made for kitchens, powder rooms, bathrooms and dining areas, featuring unique, modern shapes crafted of glazed porcelain which will not rust, tarnish nor discolor. The easy-to-clean units are available in several color combinations: black and white; pink and black; and chartreuse and green. The 1 and 2 lamp fixtures are companion pieces, having matched design porcelain bases.

Markstone Mfg. Co., 2460 W. George St., Chicago 18, Ill.

New

RIDGID

200 Tripod Power Drive

with

SPEED CHUCK



Fast Easy Chucking, new principle—guaranteed to grip tight both forward and reverse, won't slip, even with geared tools . . . 3-jaw centering device turns with pipe, conduit or rod . . . Extra-powerful motor, larger brushes, longer commutator.

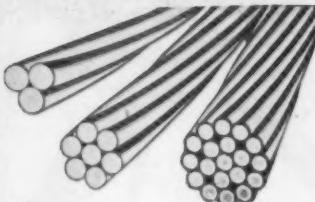
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ready to demonstrate and expedite your order.

THE RIDGE TOOL COMPANY • ELYRIA, OHIO, U.S.A.



ACCO
Quality

PAGE Stainless Steel Strand

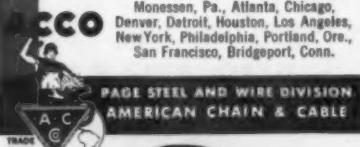


for
Severe
Service
Conditions

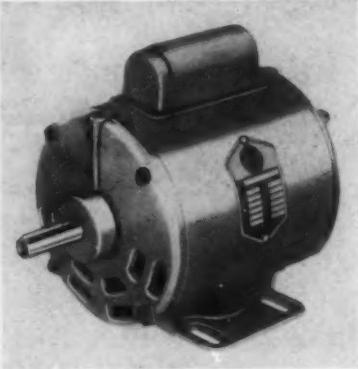
PAGE Stainless Steel Strand is equally versatile for ground, guy and catenary applications. Its higher tensile strength, corrosion-and-abrasion resistance, elastic limit and strength-to-weight ratio make it your first choice! Its lower cost per year of use means long-range economy.

*Write us at Monessen, Pa.,
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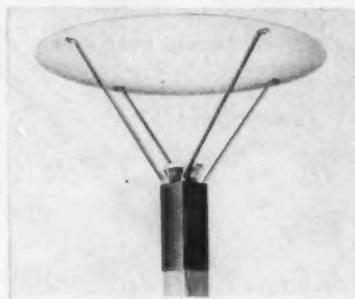
for
Better
Value



Fractional HP Motor (41)

Hy-Drive motors incorporate ribbed base, widely-spaced contact points to minimize pivoting effect, heavy steel frame, new polyester film insulation in stator slots, improved ventilation design, and new centrifugal starting switch. Applications include pumps, machine tools, farm equipment, air conditioners, fans and blowers, while 3 basic types (split-phase, capacitor-start and polyphase) are available in ratings from $\frac{1}{4}$ -1 hp.

The Hoover Co., Electric Motor Div., North Plainfield, N. J.



Post Light (42)

Outdoor post light uses a standard 150-watt flood nested in a square sleeve that slips over a 4x4 wooden post. A 32-inch steel disc atop four supporting aluminum arms reflects the light downward to the ground, providing glare-free illumination. Inside of disc is painted brilliant white for maximum reflection; outside finish is rust-proofed dull black. Unit includes 3 basic parts: disc, supporting arms and square sleeve base, plus an electrical box and porcelain fixture.

Mesa Metal Works, P. O. Box 294, Chatham, N. J.

Enclosures (43)

A new water-tight enclosure has been developed for all combination line starters through NEMA size 2. Made from sheet steel, the new enclosure is lighter and easier to install than conventional cast iron enclosures. Finished in bright aluminum, the enclosures have Oil-Tite pushbuttons with neoprene caps where required to prevent accumulated ice or sleet

from interfering with pushbutton operation. A neoprene gasket and cover held secure by screws makes this enclosure weather-proof, water-tight and dust-tight. Ample wiring space is provided within the enclosure; external mounting feet and conveniently located knock-outs facilitate installation and service.

Westinghouse Electric Corp., P. O. Box 2099, Pittsburgh 30, Pa.

Joint Compound (44)

New, improved compound for electrical joints called Alcoa No. 2. A grease-type compound which is insoluble in water, its flow point is approximately 150°F, with no tendency to harden other than natural aging. Tests indicate that the film remains in the joint up to 200°F to seal the joint and maintain stable operation. Developed for bolted bus joints (aluminum to aluminum, aluminum to copper flat bar joints, tubular joints), it is also applicable for bolted cable connections.

Aluminum Company of America, 1501 Alcoa Bldg., Pittsburgh 19, Pa.

Hole Saw (45)

Universal hole cutting tool available with increased cutting range. New Model 400 cuts any size hole from $1\frac{1}{8}$ inch to $3\frac{1}{2}$ inch in metals, wood, plastic, etc. Three electronically heat-treated high-speed-steel cutting blades may be adjusted simultaneously to the size desired by rotating a dial. It can also be used as a rotary planer, inlaying tool or grooving tool. Called Dial Saw, it comes complete with three sets of cutter blades.

Robertson and Ruth, Box 534, Elmhurst, Ill.



Fractional HP Motor (46)

Redesigned line of fractional hp single-phase motors, $\frac{1}{4}$ -hp and smaller, are capacitor-start split-phase units with shallower endplates to reduce overall length, ample ventilation openings, new designed sleeve bearings and quick-break switches. Bulletin MU-200 available with complete data.

Wagner Electric Corp., 6400 Plymouth Ave., St. Louis 14, Mo.

Air Conditioners

(47)

A new line of packaged commercial and residential air conditioners. Ranging from 2 to 7½ hp, the hermetically sealed, self-contained units are divided into three general groups. Store models in 2, 3, 5 and 7½ ton capacities, air and water cooled. Residential add-on units in 2, 3 and 5 ton capacities, air and water cooled. Year-round residential air conditioners, air and water cooled in 1½, 2 and 3 ton capacities incorporating gas fired furnaces from 75,000 to 150,000 Btu/hr. The units offer hermetic cooling system, slide-a-way chassis and the electromagnetic filter eye, which automatically flashes a signal light when filter needs to be changed. The VHC unit, Very High Capacity, consisting of a separate fan and large condenser coil in a self-contained, aluminum grill, may be mounted in a breezeway, attic, basement, on the roof, or on legs in the yard. Basic commercial unit consists of a plenum chamber for proper air distribution, blower section for air delivery, and Slide-A-Way hermetic cooling system. In residential units, the plenum is eliminated and unit connected directly to duct work. Residential add-on units are available with or without a blower section, allowing flexibility in application. Both furnace and air conditioner are combined in the same unit in the residential, year-round air conditioner.

Mitchell Manufacturing Co., 2525 N. Clybourn Ave., Chicago, Ill.

Product Briefs

(48) Complete, outdoor packaged substations are now being offered by the Line Material Co., Milwaukee 1, Wis.

(49) New key lock switch model of Lift-A-Dor automatic door operator including hydraulic hose and radio control types is announced by The Alliance Mfg. Co., Alliance, Ohio. . . (50) The Electronic Rectifier Co., Rochester, N. Y., announces its Mastodon rectifier stack measuring 12x3x3 feet. . . (51) The new Alphlex line of tubing and sleeving for industrial electronic and electrical applications is available from the Alpha Wire Corp., New York 13, N. Y.

(52) A new 30-amp, 3-wire, surface type power outlet designed for dryers, air conditioners, etc., is announced by Harvey Hubbell, Inc., Bridgeport, Conn. . . (53) Gedney Electric Co., New York 20, N. Y., announces a new combination entrance cap for use with both rigid conduit and EMT. . . (54) New Okotherm-insulated, aluminum-sheathed cable for hot (up to 200C) locations available for both power and control circuits from The Okonite Co., Passaic, N. J.

(55) New complete line of cable troughs for supporting control and power cables and instrument piping, called Uni-Tray Cable-Way, has been

WHICH

recessed fixture

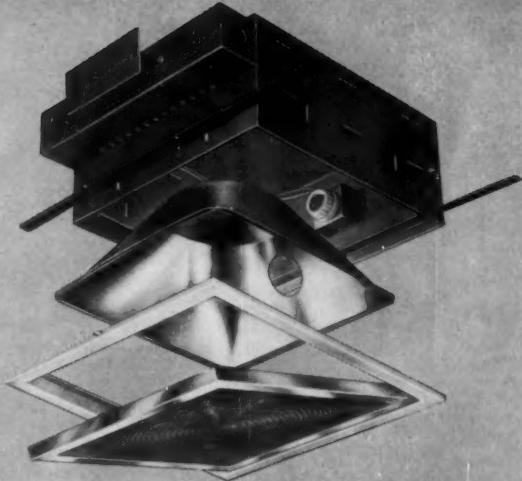
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the coolest made

a cinch to maintain



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Write for a sample and literature

announced by the Delta-Star Electric Div., H. K. Porter Co., Inc., New York 17, N. Y. . . . (56) New 70,000 series of standard cable trough with a pin-type coupler in lengths of 8, 10, and 12 ft has been developed by T. J. Cope, Inc., Phila. 43, Pa. . . . (57) A new electronic supervisor that follows preset programs and automatically switches on or off up to 40 groups of remote operations is announced by the International Business Machines Corp., New York 22, N. Y.

(58) Gedney Electric Co., New York 20, N. Y., announces new beam clamps or insulator supports available with a variety of jaw openings and tapping, in a standard range of sizes. . . . (59) An improved isolated phase bus for all current ratings up to 10,000 amps and voltages to 34.5 kv has been announced by Delta-Star Div., H. K. Porter Co., Inc., New York 17, N. Y. . . . (60) A new 20-inch 2-speed window and utility fan which delivers 3000 cfm on high speed is available from The Emerson Electric Mfg. Co., St. Louis 21, Mo.

(61) A new desk push button with magnified selectors and 42 printed designations is being made by Edwards Co., Inc., Norwalk, Conn. . . . (62) New line of slow make and break switches measuring 11½x1½x1 inch overall has been announced by Circle F Mfg. Co., Trenton 4, N. J. . . . (63) A new nylon jacket for interlock type B plugs making them shock-proof and short-proof is available from Harvey Hubbell Inc., Bridgeport, Conn.

(64) A series of heavy-duty extension cord power blocks in 6, 12, 25 and 50-ft versions furnishing multiple convenience outlets is being produced by the Rodale Mfg. Co., Inc., Emmaus, Pa. . . . (65) New EMT with a "silver" inside finish to facilitate wire pulling has been introduced by Triangle Conduit & Cable Co., Inc., New Brunswick, N. J. . . . (66) The H. R. Kirkland Co., Morristown, N. J., announces a new indicating lamp with variety of colored lens caps.

(67) New Autodor control utilizing radio-frequency signals to actuate, by remote control, garage doors and estate gates is being manufactured by Engineered Instruments, Inc., Hayward, Calif. . . . (68) Non-corrosive plastic straps for fastening and supporting all types of open wires, cables and cords have been developed by Holub Industries, Inc., Sycamore, Ill. . . . (69) A newly designed P. A. and sound system cable with a spiral wrapped tinned copper shield is announced by Belden Mfg. Co., Chicago 44, Ill.

(70) Michael Electric Co., New Haven, Conn., announces a new electric air filter equipped with germicidal sterilamp and ultraviolet bulb. . . . (71) New limit switch available for use on up to 550 volts from Clark Door Co., Inc., East Orange, N. J.

-KORD EXTENSIONS



MOLDED-ON CAPS AND CONNECTORS

FOR PORTABLE TOOLS (indoor and outdoor), LIGHTING, TEMPORARY INSTALLATIONS, MACHINES, etc.

LENGTHS FROM 10 to 100 FEET

Ask your ROYAL wholesaler
for the "POWR-KORDS" that
fit your requirements, and

**USE THEM ON
EVERY JOB!**



CATALOGS and BULLETINS

(72) POWER CONVERTER for 3-phase equipment operation on single-phase service obtains a 120-degree phase angle; available in units up to 30 hp. 4-page Add-A-Phase Bulletin. System Analyzer Corp.

(73) INSTRUMENT TRANSFORMERS. Bulletin GEC-1028, 100 pages, contains all necessary data for selection of indoor and outdoor potential and current transformers, including lists of replacement types and prices. General Electric Co.

(74) EXPLOSION-PROOF MOTOR for Class I, Group D and Class II Group F or G installations is available with or without sparkproof aluminum fan in ratings from 1 to 5 hp. Bulletin 1879. U. S. Electrical Motors, Inc.

(75) ELECTRIC HEATING guide for selection of proper type and size units for surface heating application. Bulletin GEA-6146, 4 pages, also covers selection of thermostats and controls. General Electric Co.

(76) BATTERIES for control, switchgear, and auxiliary power applications are detailed in specification bulletins CP-536-Rev. 1 and CP-537-Rev. 1, covering complete line of lead-calcium and lead-antimony batteries. C&D Batteries, Inc.

(77) LIGHTING FIXTURES. New 60-page catalog covers complete line of available units, features engineering data on exclusive Amcolens, a highly efficient new lens. Art Metal Co.

(78) RLM STANDARDS for industrial lighting units are listed in a revised 1955 edition of the Institute's 45-page specification book. RLM Standards Institute.

(79) PLASTIC COIL FORMS of self-extinguishing acetate for normal temperature or nylon for higher temperature ranges are available in sizes up to 1½-in coil lengths, 1½-in by 1½-in core, and 2-in by 2½-in flange. Cosmo Plastics Co.

(80) CONTROLS for heating, refrigeration, and air conditioning are described in a 32-page catalog giving design and operation features of all types including explosion-proof thermostats. White-Rodgers Electric Co.

(81) MOTOR BRUSHES. Lists and illustrates all common styles of brushes; gives exact brush used in all standard motors and electric tools. Additional material to aid selection of proper

PREWIRED recessed incandescent lighting fixture

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SIMPLE TO WIRE

Oversize splice compartment, accessible from inside or out. Underwriters' Laboratories Approved for use with lowest cost building wire (T, R, TW, etc.). NO ASBESTOS WIRE NEEDED!



QUICK INSTALLATION

MOUNTING BARS are nailed or tied to joists. Fixture locks into position. Perfect for any type ceiling.



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Efficient cooling system assures low operating temperature...extends lamp life.



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DOOR-WITHIN-DOOR construction prevents light leaks, regardless of ceiling condition. Spring-latched, hinged STAINLESS STEEL lens frame opens for instant access, quick relamping. Heavy gauge steel ceiling frame in infra-red baked white enamel has lifetime finish...won't rust, peel, flake or discolor.

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Housing and mounting straps in one carton can be bought separately or carton. Lens and Frame in second carton can be bought separately or kept until ceiling work is completed.

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4 types...for every lighting need...to blend with any decor. Available are Fresnel lens, Opal Glass Bowl, Alba-Lite and Semi Flush Dropped Lens.

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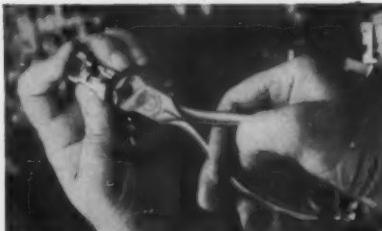
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A precut stepping dog carrier spring is trimmed to size by UTICA® No. 65 nippers.



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In Canada: Adlem Tool & Supply Co., Ltd., Montreal

brushes includes dimension charts and technical data on industrial brushes. Catalog 54. Kirkwood Carbon Corp.

(82) FARM LIGHTING booklet describes various fixtures and lamps suitable for outdoor lighting; includes pointers on distribution and wiring. 12 pages. Sylvania Electric Products Inc.

(83) ARMORED CABLE for industrial feeders is designed for indoor or outdoor applications at voltages up to 15 kv. 36-page Loxarmor manual illustrates splicing and terminating techniques as well as methods of using racks and trays for cable support. Okonite Co.

(84) GROUND TESTING SETS. Bulletin 1-2, 8 pages, includes application and engineering data on the eight available models of Vibroground sets for measuring ground resistance and soil resistivity. Associated Research, Inc.

(85) SWITCHGEAR rated at 2.4 kv to 13.8 kv and 50 to 500 mva is detailed in 54-page bulletin GEA-5664C covering applications, installation, maintenance, design features and accessories of metal-clad assemblies. Complete instructions for specifying or ordering equipment. General Electric Co.

(86) PROCESS CONTROL instrument provides dual function of recording exact time of operation and totalizing operating time. 4-page folder. Heat-Timer Corp.

(87) TRANSFORMERS for mercury lamp street lighting installations are detailed in 16-page bulletin 551-5. Operating characteristics, mounting instructions and dimensions are given. Jefferson Electric Co.

(88) UNIT SUBSTATIONS are available with all the popular types of high voltage section equipment, four types of transformers, and three types of low voltage switchgear. Bulletin 102, 16 pages, features a one-page listing of dimensions, weights, and operating data. Continental Electric Equipment Co.

(89) ROTARY LIMIT SWITCHES. New 4-page brochure details applications and construction features; specifications and prices are also included. Gemco Electric Co.

(90) SUPERMARKET LIGHTING booklet designed as a sales aid, points up the dollars and cents value of good, modern lighting. Its 12 pages include descriptions of the various fixtures and lamps commonly used, as well as brief comments on window and exterior lighting. Sylvania Electric Products Inc.



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2502 N. 30th Street
Milwaukee, Wisconsin

(91) CONDUIT FITTINGS, connectors, straps, and associated items are listed in 28-page catalog. Steel Electric Products Co.

(92) LIGHTING FIXTURES. Catalog 55 gives complete descriptions and illustrations of the entire line of incandescent and fluorescent units. F. W. Wakefield Brass Co.

(93) ADJUSTABLE FIXTURES and high hat units. 32-page Bulletin 132 illustrates complete line, describes design features and mounting instructions. Swivelier Co., Inc.

(94) RESIDENTIAL LOAD CENTERS, for distribution and service entrance are available in several different models to serve any typical requirement. Ratings, specifications, dimensions are provided in 12-page bulletin GEC-1309. Trumbull Components Dept. of General Electric Co.

(95) LOAD CONTROLS designed to detect changes in current above or below a preset limit. Unit features an adjustable current-sensitive relay, pilot light and reset button. Bulletins LC-2.1, 2.2, and 2.3. Machinery Electrification, Inc.

(96) HEATING CALCULATOR KIT contains six pages of technical data for determining heat loss, kw rating and electric heating costs; a slide rule computer; and maps and tables covering design standards for the entire United States. Product literature on electric heating units is also included. Meier Electric and Machine Co.

(97) CENTRAL CONTROL SYSTEM automatically switches on or off up to 40 groups of remote operations—each on its own time schedule. Carrier current pulses sent over existing power and light circuits activate coded relays at point of operation. Provision is made for manual control and expansion of control system. Application and Operation Booklet and technical folders describing components are available. International Business Machine Corp.

(98) CABLE TROUGH features built-in pin-type coupler, is available in 6-, 9-, 12-, 18-, and 24-in. widths with complete line of fittings for each size. 16-page catalog on this 70,000 series gives dimensions and illustrations of each element. T. J. Cope, Inc.

(99) SINGLE-PHASE MOTORS of $\frac{1}{4}$ hp or less in the capacitor-start and split-phase types have been completely redesigned to obtain shorter length and improved efficiency of operation. Bulletin MU-200. Wagner Electric Corp.

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SMART, MODERN accent lighting fixtures can enhance the beauty and selling-power of your displays. Small wonder that the new AMPLEX models are the choice of display men—they lead the field because they do a real selling job!

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Reader's Quiz

QUESTIONS from readers on problems of industrial equipment, installation, maintenance and repair. Answered by electrical maintenance engineers and industrial electrical contractors out of their experience. For every question and every answer published we pay \$5.00.

Rectifier Efficiency

Question T27—How does the efficiency vary between zero voltage and full voltage at various loads for rectifiers and filters?—E.B.

ANSWER TO T27—E.B. does not state the particular type of rectifier in which he is interested. However, I believe that all types would have less efficiency at low voltages compared to efficiency at rated or full voltage. The resistance of the rectifier is not constant, being greater at low voltages. This increased resistance means a decreased efficiency.

Filters, however, are normally constant in resistance, that is, the resistance of any one filter does not change with voltage or current. For this reason their efficiency does not vary with voltage.—P.S.

ANSWER TO T27—Rectifiers and filters must be made to match the load, voltage, and job. Choke coils, resistors, and condensers are used to protect the rectifier and smooth the voltage. If we use a transformer to reduce the voltage then we have high efficiency at low voltage. If we use a bleeder resistance then we have low efficiency. The designer should consider a lot of things when setting the efficiency, or he will save pennies and throw out hundreds of dollars.—H.S.

Insulation Testing

QUESTION U27—In our plant, we have been periodically using a 500-volt dc Megohmer to test insulation resistance on 115-volt to 440-volt equipment with very good results. We now have some new generating equipment which operates at 600 volts ac. Is there a conversion factor which we can use to apply to readings so that this 500-volt dc instrument can be dependably used on 600-volt equipment?—C.A.K.

ANSWER TO U27—The testing equipment available should be satisfactory for generating equipment operating at 660 volts ac. based on actual experience. Realizing that insulation resistance is at best a qualitative test, its value cannot be considered to be a final one although when compared with previous tests, conditions being the same, it may be possible to reveal marked changes. The AIEE has included in its Rules a recommendation

that machine insulation resistance should be not less than the value calculated from the formula:

$$\text{Insulation Resistance in megohms} =$$

$$\frac{\text{terminal voltage}}{\text{rated capacity (kva)} + 1000}$$

This would indicate values as follows:

Rated voltage	Megohms	
	100 kva	1000 kva
100	0.091	0.05
1,000	0.91	0.50

Other values are readily calculated.—C.O.D.

ANSWER TO U27—Your 500-volt Megohmer is sufficient for testing 660-volt equipment without any conversion factors to worry about. The insulation test will show up just as well with the 500-volt impressed voltage as if a higher voltage were used. On a coil of a motor that has broken down to ground, I use a small transformer 2300 to 110 volts, limiting the current on the 110-volt primary with a small bulb. The 2300-volt secondary will give you an arcing on the ruptured coil, which is very easy to find.—E.S.H.

ANSWER TO U27—In dealing with equipment beyond the range of the output of our 500-volt Megger we have found it practical, more substantial and wiser to invest in a 750-volt Megger than to confuse the issue by applying conversion factors.

In this way we have a Megger which we know covers the range of our usefulness and limits the possibility of the human error in forgetting to apply the conversion factor.

Secondly, the 750-volt Megger over-reaches the 660-volt maximum in stressing the insulation which the 500-volt Megger will not do, for our prime objective is to subject the insulation to a maximum safe value and not to a conversion factor.—J.B.K.

Sealed Bearing Maintenance

QUESTION V27—We have a number of 1.2 and 2.0 kw motor generator sets installed on railroad cars to convert dc to ac for fluorescent lighting. Many of these are equipped with pre-lubricated sealed ball bearings. We would like to

know what attention these bearings should receive when the machines are overhauled. Should they be cleaned, inspected and regreased, and, if so, how? The m-g sets are generally overhauled every 24-36 months during car shoppings.—D.H.N.

ANSWER TO V27—Pre-lubricated, sealed ball bearings can not be cleaned, as they are sealed tightly at the factory where they are made to prevent the penetration of foreign particles into the bearings during their life. I have known of instances where this seal was broken and an attempt made to clean, regrease and reseal the bearing. Resealing could not be accomplished as it had been by the factory and so the entire bearing had to be discarded.

A sealed bearing could be tested like any other ball bearing by rotating small bearings between the fingers and thereby detecting flat places in the balls and also by observing whether or not the grease seal had been leaking.

Either defect indicated by inspection would render this type of bearing useless and must be replaced with a new one.

For preventive maintenance, in your case, it would be a good idea to replace these bearings on the generator units which you have mentioned with new ones regardless of how they appear and feel. Even after the most careful inspection, a bearing of this type might go bad after a month or so in service and cause complete breakdown of the generator units thereby cutting off much needed fluorescent lighting in railroad cars.—L.C.D.

ANSWER TO V27—Since the m-g sets are overhauled every 24 to 36 months it would be a good time to inspect them then. The grease generally used in bearings of this type will provide adequate protection for at least three years. No grease need be added at this time (if it is the two-year period). At the end of the third year remove the shield on the outer end of the bearing and examine the grease. If it has a bad odor or is discolored the bearing should be cleaned and repacked. If the grease shows no discoloration and has no odor, replace the shield and the bearing may be replaced in the m-g set.

However, if the bearing has to be cleaned and repacked with grease, proceed as outlined.

First remove all dirt from the ad-

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YOU GET THE BEST

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Both sleeve and "Wrap-Cap" Insulator listed by Underwriters' Laboratories, Inc. for General Use (600v.) in Branch Circuit and Fixture Wiring.



Just two parts—the sleeve and the Wrap-Cap.



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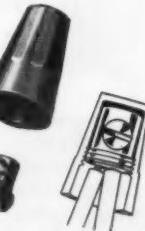
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CRIMP CONNECTORS with the unique **"Wrap-Cap" *** INSULATOR

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The new kind of crimp connector that gives you a perfect pre-fabricated insulating job every time. Insulates all around the joint and between the wires; gives double protection over sleeve and wire ends. Deep skirt completely covers bare conductor, even when wires are not stripped evenly. * Patented, No. RE 23649 and other patents pending.



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New Improved Design

No Solder, Tape or Special Tools

Permits visual inspection of joint after it has been made. Can be re-used — makes circuit changes easy. Requires only a screw driver. New—Knurling makes phenolic shell easier to grip and screw onto brass sleeve. New—More compact shape. Extra long skirt prevents flashovers, gives high dielectric protection. Contractor sizes No. 11 and No. 22 fully approved as 600v. pressure cable connectors for general use. New smaller size (No. 10) approved for 300v. fixture wiring and appliance hook-up.

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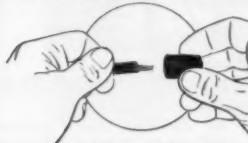
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THE SOLDERLESS TAPELESS WIRE CONNECTOR
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**The Screw-On Connectors
That Have Been First Choice
for Over 30 Years!**



Contractor sizes 74B and 76B fully approved as pressure cable connectors for general use in all types of branch circuit wiring.

Millions more used than any other kind for pig-tail splices. Just screw them on—like a nut on a bolt. They twist, thread, grip with spring tension and insulate—all in one positive operation. Connection is shake-proof, pull-proof, actually stronger than the wire itself. No other connector grips tighter or holds longer. Precision molded phenolic shell covers all bare wire—never shorts out, gives lifetime high dielectric protection.



TAP CONNECTORS

- Hold Tighter • Easier to Use • Cost Less

New Distortion-proof Design



All-new design uses zinc-coated steel to give Ideal Tap Connectors greater mechanical strength and more pressure on joint. Steel resiliency keeps joint always tight, under spring tension. Extra large pad gives greater contact area, more gripping power. Easy to use—no loose parts to fall off, even with spacer bars. Joint is visible from all sides. Three Connector sizes handle all common wire combinations. Models for copper-to-copper and copper-to-aluminum.

Try Ideal Service Entrance Connectors, for solderless pressure connections between service drop wires and service entrance cables.

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The only transformer backed by a 5-year guarantee! Only Precision offers this important long-range protection . . . your assurance of superior design, material and workmanship. Reduces costly repair work, power failures, work stoppages! Be precise — install Precision.

Full Rated Load — Carry full loads continuously . . . capable of handling emergency overloads.

Dependable, Quiet—Ruggedly constructed to exceed latest NEMA standards! Unsurpassed for smooth, silent operation.

Easy To Service — New handy panel board gives quick access to all taps.

For operating special equipment from standard circuits. To change odd voltages to standard voltage and phase changing.

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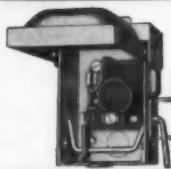
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adjacent parts, so that none will fall upon or into the bearing or the housing. Cover the bearing and the interior of the housing with clean material if they are to be left alone for any period of time while completing the overhaul.

If carbontet is used to clean the bearings, a light oil should be applied to the raceways immediately to prevent rusting. The best method to employ is to place the bearing in a basket and suspend the basket in a suitable container using a cold clean petroleum solvent or kerosene and soak over night. If you find that the bearings are badly oxidized with grease and time is a factor, soak the bearings in hot light oil (200 to 240 degrees) and agitate the basket from time to time.

The use of compressed air is not recommended unless the system is properly filtered.

Oil used for cleaning the bearings should not be any heavier than SAE 10.

The above recommendations depend on the shields or seals of the removable type if they are not of such construction they are not likely to be subjected to contaminated lubricant.—B.A.C.

Phase Rotation and Angular Displacement

QUESTION W27—When hooking up a 33 kv to 2.4 kv delta-delta transformer (polyphase) it was necessary to connect it to an old 2.4 kv line, just as an emergency line. One engineer said all we needed was a phase rotation meter. Another engineer said phase rotation with polyphase transformer is not enough and went on to say that even when phase rotation is correct it must also be checked for angular displacement with another testing device. Who is correct and why?—M.D.

ANSWER TO W27—A test for phase rotation was sufficient if the secondary system were fed from only one source. If the system were to be supplied from two or more transformer banks, likely to be placed in parallel at any time, tests should be made both for phase rotation and angular displacement.

If there is only one power source, it is only necessary to see that the motors do not become reversed during the change-over. Also, naturally, it is necessary to be sure that any established secondary grounding is not disturbed.

When two sources are connected together, they must be in phase with each other. A delta-wye bank, for instance, would not operate successfully with a delta-delta. There always will be a

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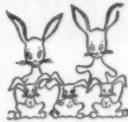
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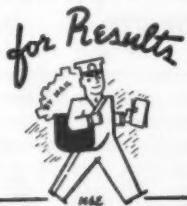


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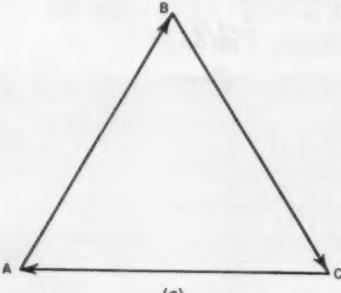
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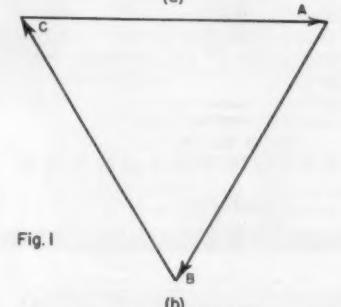
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phase displacement which would lead to excessive circulating currents—a situation which cannot be corrected under any circumstances. Like transformers, but having opposite polarities, will have the same phase rotation but will have 180 degrees phase displacement. Correction can be made in the connections.

These statements can be visualized from voltage diagrams. Figures 1 and 2 are drawn to show the secondary



(a)



(b)

voltages of transformer banks having delta connected primaries. It will be noticed that the phase order A-B-C, in this case, can be read clockwise around all four diagrams. This definitely indicates that phase rotation is the same in all cases.

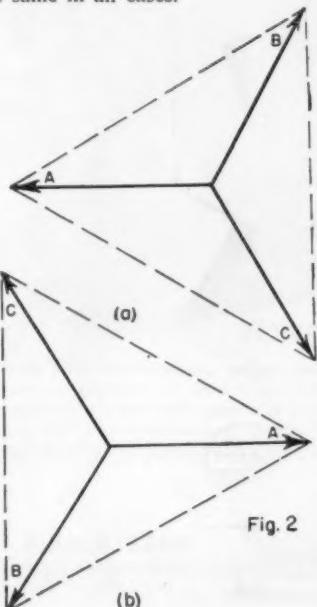
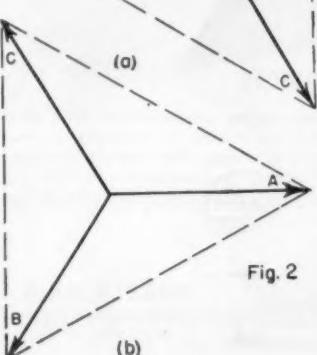


Fig. 2
(a)



(b)

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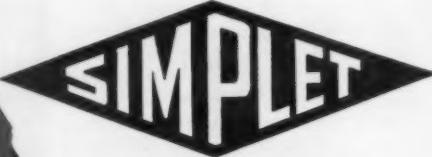
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The direction of the phase voltages in the two delta diagrams are opposite to one another. Inter-connection would produce short-circuit conditions. Yet, diagram 1-a will correspond to 1-b if all voltages of either are reversed. Likewise, 2-b will coincide with 2-a by reversing all voltages of either connection. Thus, reversed polarity can be corrected in the connections.

The line-to-line voltages in the wye connections, Fig. 2, can be found by constructing a delta, shown dotted here, by connecting the points of the wye. It is impossible to make the diagrams of Fig. 2 coincide with those of Fig. 1, because of an inherent phase displacement between the two transformer banks. Interconnection of such transformers would lead to excessive current flow.

During the planning stage of any change in transformer banks, it is well to construct voltage diagrams such as these. This is especially true when replacing or interconnecting transformers of different age, made by different manufacturers, or having different relative connections (delta or wye). Then, it is possible to decide what may or may not be satisfactory. Preliminary shop or field tests can be made for polarity.—L.E.B.

Can you ANSWER these QUESTIONS?

QUESTION F28—Is it possible that a fluctuating load on a 20-hp air compressor would cause lights to flicker? The compressor is part of a load at a station fed by two 25-kva transformers. High lines are No. 2 copper. The light flicker takes place at other stations fed by 5-kva and smaller transformers. The high line is 4265 volts. —E.S.H.

QUESTION G28—One of the 3-phase electric arc furnaces we service has been burning one of the carbon electrode ends at about 45-degree angle facing the shell of the furnace and causing rapid deterioration of the lining in that area. The other two electrodes burn off nearly flat as they should. The spacing of the electrodes is equal and the voltage on each phase is the same; 180 volts on the low tap and 235 volts on high tap. What could be the cause of this condition?—J.J.L.

QUESTION H28—How does a rapid start fluorescent lamp operate and how does the ballast and lamp differ from the regular preheat type?—D.H.N.

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ADV.

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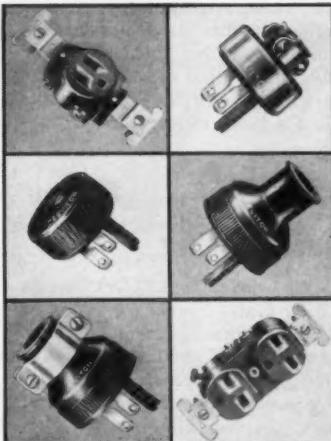
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Questions on the Code

Answered by

B. A. McDONALD, New York Board of Fire Underwriters, Rochester, N. Y.

GLENN ROWELL, Electrical Engineer, Fire Underwriters Inspection Bureau, Minneapolis, Minn.

B. Z. SEGALL, Consulting Electrical Engineer, New Orleans, La.

Computing Feeders

Q. What size of feeder is required for an eight 15-amp-circuit panel—400 cycle, 115 volts, 3-phase? —G.R.

A. Section 2201 of the Code tells us that a feeder shall have a current rating not smaller than the feeder load as determined by Section 2203. Section 2203 tells us that the computed load of a feeder shall not be less than the sum of all branch circuit loads supplied by the feeder, as determined by Section 2116 subject to the other provisions in Section 2203. In the absence of any information with respect to the loads to be served, it is impossible to answer your question. Assuming however that small 3-phase motors, each not exceeding 6-amp rating, are to be grouped on each of the 15-amp branch circuits, as covered by Section 4343, and that the circuits are loaded and the demand factor recognized by Section 4316 does not apply, it would be necessary to compute the feeder on the basis of 15 amps per circuit, which would result in a 120-amp size. If the circuits supplied small single-phase motors connected in delta over the 3-phases, then the phase current values must be multiplied by 1.73 to obtain the line currents. If the circuits supplied both lights and motors or heaters other rules are involved. It would be necessary to have such details in order to give a definite answer to your question.—B.A.McD.

Lighting for a Garage

Q. I am now in trouble with the local inspection department following a wiring job in a garage in which I have mounted a number of conventional lighting fixtures some $10\frac{1}{2}$ feet above the floor of the garage building. The electrical inspector now tells me I will have to raise these to a height of at least 12 feet above the floor in order to comply with the existing ordinance. As this garage is used only for the repair of passenger automobiles, I see no reason for raising these fixtures above their present level.

Can you explain why such a rule should be in a code or ordinance?—O.M.A.

A. If you will refer to paragraph f. 1. of Section 5105 of the 1953 National Electrical Code, you will note that it reads as follows:

"Equipment which is less than 12 feet above floor level, and which may produce arcs, sparks or particles of hot metal, such as lamps and lampholders for fixed lighting, cut-outs, switches, receptacles, charging panels, generators, motors, or other equipment having make and break or sliding contacts, shall be of totally-enclosed type or shall be provided with suitable guards or screens to prevent the escape of sparks or hot metal particles."

Inasmuch as the Code under this same section also provides that the area within 18 inches of a floor shall be considered as a hazardous area, the 12-foot rule has been written in to provide against the possibility of a hot filament dropping out of a broken lamp bulb into the 18-inch area above the floor where gasoline vapors might be present. Therefore, fixtures located at a level lower than 12 feet from the floor should be within double globes or should be screened in such a manner as to prevent hot particles falling to the floor in the event of lamp breakage.—G.R.

Fixture Wiring

Q. In your column "Questions on the Code" there is a question by WRB in reference to wiring fixtures.

It is an accepted practice in this area to enter first fluorescent fixture with either armored cable, Romex, conduit and then continue on through all other fixtures that are hooked end to end as a trough, with AF wire.

Is this practice wrong? The answer to the question by GR does not state what type of wire is permissible.

Should the circuit feeder be armored cable, must rubber covered wire be used throughout from end to end?—D.W.

A. No, the practice you outline is correct and acceptable by many

inspectors. Some inspectors will permit Type RH wiring in the trough if this circuit wiring is so arranged as to keep the RH conductors away from the ballast.

The type of wiring for fixtures is covered in Section 4141 to 4151, inclusive. Specifically, Section 4179 covers the wiring for fluorescent recessed fixtures.—B.Z.S.

Type UF Cable

Q. We are planning to wire some tract houses with slab floors and flat roof beam ceilings. They are low cost and meet minimum FHA requirements. Due to the fact that there is no space to conceal wiring overhead and a very minimum of partitions, we have decided to wire them under the floor with A-Z direct burial wire.

Where can we run the cable? In the slab, on top of the membrane, under the membrane, in the gravel base or under the base in contact with the ground? (In the slab preferred.)

They are going to be built in an area where there is no building inspection, the only code applying being that of NEC.—M.M.S.

A. A-Z Cable is recognized by Article 339 of the N.E. Code, under the designation of Type UF, for direct burial in the earth and in other wet locations. It also may be used for interior wiring when complying with the provisions of Article 336. Sections 3102 and 3392 cover the details involved. A review of these provisions indicate that the Code does not permit this cable to be "embedded in poured cement, concrete or aggregate". It therefore follows that the cable could not be run in the slab, in the gravel base or under the membrane. Assuming that a wood floor will be installed over the slab, it might be possible to run the cable on top of the membrane provided there is sufficient space and particular attention is given to protection from mechanical injury such as could be involved by the use of nails. There would be no question concerning its use buried in the ground under the base.—B.A.McD.



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Panelboards

Q. What special provisions must be made on a lighting panel containing two 40-circuit single pole lighting sections, one above the other, each feeding circuits top and bottom? —A.P.B.

A. Section 3882 limits the total number of lighting and appliance branch circuit overcurrent devices which can be installed in any ONE CABINET OR CUTOUT BOX. This rule states that 42 such devices is the maximum that can be so installed.

Therefore in your case, these two units would have to be installed in separate cabinets.—B.Z.S.

Service Capacity

Q. I plan to increase service capacity in a small plant which is now served by three Type RH 1/0 conductors. I plan to parallel these with four Type RH 1/0 of the same length and replace the present undersized service switch with a new 400-amp cabinet. The contemplated total load will be approximately 250 amps, but the distribution cabinet is located at considerable distance from the service entrance switch. Hence, to control voltage drop I had planned to use three 500,000 circular mil conductors for the three phases and a 1/0 conductor for the neutral. While I am providing 300-amp fuses in the 400-amp service entrance switch, the local inspector has brought up the point that there is nothing to prevent the plant from placing 400-amp fuses in this switch as the feeder conductors between it and the distribution cabinet are capable of carrying more than the present rating of the fuses provided and he has suggested it might be advisable for me to parallel three 1/0 Type RH conductors for each phase so they cannot overfuse the service should they replace the present 300-amp fuses with 400-amp fuses. Would this be required by the Code?—M.W.

A. Your installation in no way violates the requirements of the National Electrical Code providing the service conductors are in conformance with Section 2304, which specifies that they shall have adequate current carrying capacity to safely conduct the current for the loads supplied without a temperature rise detrimental to the insulated covering of the conductors. As there is no way to stop overfusing of any service or circuit, one must assume that those using an electrical installation will have the intelligence to maintain the proper type of overcurrent protection. I do believe a con-

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tractor is obligated to acquaint management of a building he wires with some of the necessary information concerning the overcurrent protection which should be used as well as the limitations of the installation.

I have assumed that in paralleling the original service, you have used a separate conduit for the four new conductors, as the use of a single service raceway for six conductors would limit their carrying capacity to 80% of 300 amps or 240 amps. Since this may be the premise on which the inspector is basing his recommendations.

If that is not the case, the inspector may be of the opinion the load will soon grow to the point where the full rating of the service switch will be required, in which case it would, of course, be good engineering practice to provide the capacity at this time.—G.R.

Column Type Panelboards Continued

Q. In the December 1954 issue of E.C.&M. your comment on the above subject might be taken to infer that column panelboard assemblies approved by Underwriters' Laboratories would be in violation of the N.E.Code. I have in mind the Bull Dog Electric Products Co. assemblies where the panelboards with one panel extension to a pull box are approved by U.L. Here we have the narrow column type panels listed under U.L. Title No. E-2269. The pull box containing the neutral bus are listed under U.L. 19557 and the auxiliary gutter is listed under file E 10450 for use with the panel and the pullbox. While your comment with respect to the neutral bus located in the pullbox undoubtedly concerned the particular combination presented, the reaction from the field indicates a need for clarification when U.L. approved assemblies are used.—K.P.S.

A. It is quite true that my previous comment on this subject only covered the particular case presented, and the conditions involved, while similar, were not the same in all respects. In the case of the BullDog assembly, the connection between the panel and pullbox is made by one auxiliary gutter. Here we have all of the live conductors in one raceway, and the inductive effect is neutralized. In the case presented, we had two auxiliary gutters between the panel and the pullbox, and it was impossible to so arrange the conductors to eliminate induced currents as provided in Section 3018. Past experience indicates to me that such an

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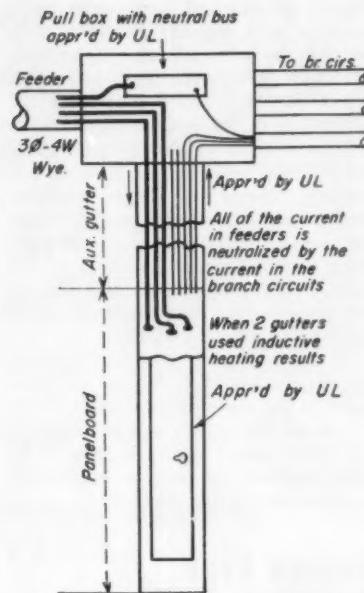
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arrangement of conductors could only result in considerable heating of the metallic circuit formed by the two gutters. In the case presented, I also stated that a question might arise concerning the use of a pull box for enclosing the bare neutral bus. Ordinarily pull boxes are concerned with conductors which are fully insulated, and I do not believe that any unrestricted use for enclosing bare neutral bus bars ever was intended. Here we have questions of insulation and installations to be considered which ordinarily should not be placed on the shoulders of the inspector. In the case of the BullDog assembly the pull box is approved by U.L., the auxiliary gutter and the panel are likewise approved and I believe it would be correct to assume that these component parts when assembled would be considered as parts of the panelboard. I also note that the maximum number of circuits for such panelboards is limited to 32. This tends to restrict the number of conductors within the gutter to a conservative amount in view of the size of the gutter.

I trust that the foregoing clarifies my position with respect to the issues raised. Years ago the problem presented by panelboards located on columns were the source of considerable controversy. Could they be connected to the pull box by one large conduit containing 40 or 50 conductors? This and other questions arose. The problem undoubtedly has been solved by the development of U.L. approved column type panelboards combined with the essential approved components to make this connection. See figure above.—B.A.McD.

NEC Official Interpretations

A series of seven official interpretations of the 1953 National Electrical Code have been reviewed and released by the Electrical Correlating Committee of the National Fire Protection Association. These are in addition to the official interpretations of the 1953 Code previously released and published, in selected items, by the NFPA in the 1954 edition of the National Fire Codes, Volume V, Electrical.

The full official texts of the latest interpretations are as follows:

INTERPRETATION NO. 397

SECTIONS 3814 and 4383-b; Snap Switches, Use of

Question No. 1—Do general use, ac, snap switches at full load current rating on tungsten filament lamp loads comply with the intent of paragraph b of Section 3814?

Answer—Yes.

Question No. 2—If an ac rated, general use snap switch, which is tested at a power factor of 40% to 50% with the current at 480% of its full load current rating, is used as the control of a stationary motor of 2-hp or less, must it meet the requirements of paragraph b of Section 4383 or may it be used to control a motor having a full load current equal to the switch rating?

Answer—It may not be used to control a motor having a full load current equal to the switch rating, but it may be used to control a motor having a full load current rating equal to 80% of the switch rating.

INTERPRETATION NO. 411

SECTION 5105-f; Use of Open Type Fixtures

Question—In an open-type of multi-story parking garage, the floors of which are classified as a hazardous area, may open-type fluorescent lamps without suitable guards or screens to prevent the escape of sparks or hot metal, be mounted less than 12 feet above the floor?

Answer—No.

INTERPRETATION NO. 412

SECTION 2411; Multiple Fusing Of Motor Circuits

Question No. 1—Does Section 2411 prohibit the use of fuses in multiple on low voltage controllers feeding motor branch circuits?

Answer—Yes.

Question No. 2—Does Section 2411 prohibit the use of fuses in multiple on high voltage controllers feeding motor branch circuits?

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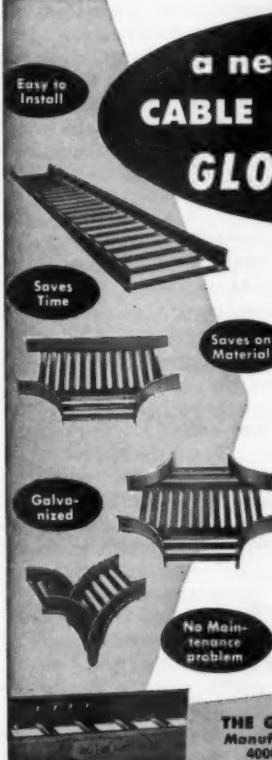
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CODE PROBLEMS in the South were discussed between sessions of the IAEI Southern Section meeting in Tampa, Fla., by (l. to r.) Leon Roberts, inspector from Valdosta, Ga., Carl Witherall, inspector from Daytona Beach, Fla., and B. A. McDonald, IAEI President, from Rochester, N. Y.

Answer—Yes.

INTERPRETATION NO. 413

CHAPTER 9; Parallel Cords, Construction of

Statements: A three-conductor parallel cord is intended for use with air-conditioning equipment. The cord consists of two conductors having $\frac{1}{2}$ -in. of the thermoplastic insulation and one conductor with a covering of $\frac{1}{2}$ -in. of green thermoplastic insulation. The two conductors having the heavier wall of insulation are intended as the current-carrying conductors to the air-conditioning equipment, while the third conductor with the thin green covering is intended as the grounding conductor. All conductors are of the same size, but the green covered conductor is placed between the two current-carrying conductors and is exposed only when the cord is separated at the terminals.

Question— Does this construction comply with the intent of Sections 94003, 94004, 94005, and paragraph b of Section 2559 of the 1953 edition of the National Electrical Code?

Answer—Yes.

INTERPRETATION NO. 414

SECTION 2003; Autotransformers

Statements: An emergency service in a hospital is obtained from a 3-phase, ungrounded, delta-connected, 240-volt generator through a zig-zag wye connected autotransformer that changes the voltage to 120/208 and provides a grounded neutral. This grounded neutral is solidly connected to the neutral of the main service from the public utility supplying the hospital with light and power.

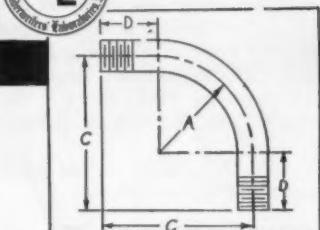
Question— Does this use of the autotransformer comply with the intent of Section 2003?

Answer—Yes.

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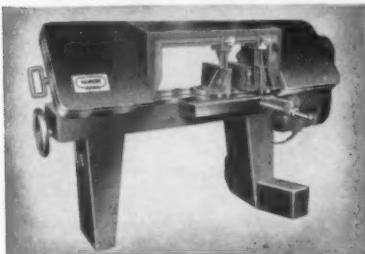
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INTERPRETATION NO. 408

SECTION 2390; Isolating Switches

Statement: A metal-enclosed factory-built cubicle is installed in a vault and constitutes the service equipment to a privately owned building. A 13,200-volt service goes through a circuit breaker which does not disconnect the service from the cubicle. The cubicle is fixed in position, but the circuit breaker is so interlocked that the breaker must be in the open position before it can be removed from the cubicle for inspection or servicing.

Question—Does Section 2390 of the 1953 edition of the National Electrical Code require an air break isolating switch in the incoming service line ahead of the service circuit breaker?

Answer—No.

INTERPRETATION NO. 410

SECTION 5135; Anesthetizing Locations and Anesthetic Storage Rooms

Question No. 1—Section 5135-b-1—May a room or space in which combustible anesthetics or volatile flammable disinfecting agents are stored and which in this sub-paragraph is declared a Class I, Division 1 location in its entirety, but which is not located in areas described in a-2 of this Section, be supplied from the grounded supply system?

Answer—Yes.

Question No. 2—Section 5135-a-2—Does the term "Anesthetizing location" as found in this sub-paragraph mean the entire location up to the ceiling height?

Answer—Yes—See also 5135-b-2.

Question No. 3—Section 5135-f-1—Do transformers used to supply the ungrounded distribution system called for in this sub-paragraph mean any type of two coil transformer so long as there is no electrical connection between the primary and secondary windings?

Answer—No—See 5135-f-2.

Question No. 4—Section 5135-h-2—Does X-ray equipment installed or operated in an anesthetizing location, as defined in sub-paragraph a-2 of this Section, have to be supplied from the isolated ungrounded system?

Answer—Yes.

Question No. 5—Section 5135-h-2—Must the circuit supplying a portable X-ray, used within the hazardous area of an anesthetizing location, be served from an isolating type transformer if the receptacle supplying the X-ray is located outside the hazardous area?

Answer—Yes.

Question No. 6—Section 5135-f-1—Do all circuits, including circuits to fixed ceiling mounted lighting fixtures and suspended surgical fixtures, have to be supplied from the ungrounded distribution system?

Answer—Yes.

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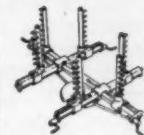


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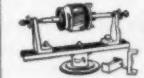
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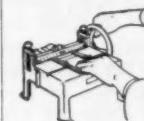
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In The News

Minn. Contractors Hold Annual Conference

More than 160 electrical contractors from Minnesota attended the 18th Annual All-Industry Convention of Upper Midwest Electrical Trade Groups held in Minneapolis March 6-9. The conference, coordinated through the North Central Electrical League, drew some 800 representatives of contractors, commercial utilities, municipal utilities, electric cooperatives, inspectors, manufacturers and wholesalers. Each group discussed its own problems in separate meetings and joined in general sessions where topics of interest to all were on the agenda.

The contractor conference marked the 27th annual meeting of the Minnesota Electrical Association, Inc.—an organization of some 245 contractors throughout the state of Minnesota. Reports by association officers indicated satisfactory progress in many activities. Among them are: revision of the accounting and estimating manual; resolution of any conflicting policy with other industry groups; continuance of a business management service to help members establish sound business practices; and continuance of an apprenticeship training program. Although a majority of the trained apprentices eventually go to non-members, the association considers this activity a benefit to the entire electrical industry, it was noted.

One serious problem faced by all electrical contractors in the area, and revealed at this meeting, is a reputed move on the part of the Associated General Contractors groups to have architects establish a single-bid system and award just one contract (including all mechanical trades) to the general contractor. This is in contrast to the multiple-bid system where contracts for mechanical trades work are let separately. Reports indicate that the mechanical trades, consulting engineers and unions are opposed to this latest move and are ready to combat it. Among the evils of the single-bid system, they see ultimate elimination of the mechanical contractor or at least development of a condition which would force the mechanical contractor to work only through a general contractor.

State legislative matters of interest to the contractors were reviewed by Sheldon L. Beanblossom, former MEA manager and now a member of the



NEW OFFICERS OF the Minnesota Electrical Association elected at the 27th Annual Meeting of the contractor organization during the All-Industry Convention in Minneapolis are: (L to R) vice president—Gifford Perry, Austin; treasurer—Elroy Lehn, Anoka; president—Wm. A. Ritt, St. Peter; secretary—Edward Linner, Stillwater; and manager—Carl Birk, Minneapolis.



CODE EXPERTS IN ACTION before packed house at recent electrical industry convention in Minneapolis include: (L to R) Ray Braun, Minn. State Board of Electricity, St. Paul (standing); Glenn Rowell, electrical engineer, Fire Underwriters Inspection Bureau, Minneapolis; George Jessen, electrical inspector, Winona, Minn.; and S. Martin Streed, chief electrical inspector, Minneapolis.

Minnesota Legislature. In the hopper at the Capitol in St. Paul are bills to: amend the Fair Trade Practices Act to put the small business man on par with the big operator; increase electrical license and examination fees; destroy the right to sue unions; increase unemployment compensation; increase state income tax; establish non-occupational disease benefits with employee and employer contributions; establish wage-lien rights for employees.

Electrical markets, other than the normal highly competitive ones, were explored at the session. Among the possibilities suggested were: sale of complete kitchens with the electrical contractor subletting any carpentry, plumbing and decorating necessary; sale of pre-fabricated homes with the electrical contractor installing adequate wiring system and subletting the house assembly and other mechanical work; promotion of electric garage door openers, fire alarm systems and



CONTRACTOR-DEALERS form a ready group of electrical salesmen and technical experts in rural areas, contractor Moreau Bailey, Albert Lea, Minn., tells farm wiring representatives attending the recent electrical industry convention in Minneapolis. Conference, coordinated by the North Central Electrical League annually brings together all segments of the electrical industry.

supplemental electric heating as well as package residential service rewiring plans.

The recently inaugurated Twin City Rewiring Package Plan carries minimum requirements of a 3-wire, 120/240-volt, No. 2 RH (115-amp) conduit and cable service, four 2-pole, 240-volt, fused pull-out circuits and ten 120-volt lighting and appliance circuits (two of them 20-amp capacity). To date, more than 60% of inquiries received have resulted in sales. Although the average package deal sells for about \$175, additional rewiring purchased by the customer has upped the average sale to about \$300, it was reported.

Another farm wiring market is being created by the Twin Cities Milk Producers Association who have announced a plan to install milk coolers on 4,000 dairy farms to facilitate tank-truck milk delivery to processing plants. This involves installation of two 20-amp circuits on each of these farms: one circuit for the compressor motor (1 to 5 hp) on the cooler, one switched receptacle circuit at the loading dock for the one horsepower pump motor on the tank truck. If this initial program is successful, it may lead to 50,000 or 60,000 such installations in the next five years, it was predicted. Contractors making these circuit installations will have excellent contacts for selling farm rewiring.

News of the availability of competent electrical contractors is reaching every farm in Minnesota, through a series of 12 Minnesota Electric Association advertisements in The REA News—the official newspaper of the Minnesota Electric Cooperative. Through this medium, the Associa-



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Bolt and Anchor in one piece—drives like a nail. Used only in hard materials, such as concrete, stone, etc.



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**LOOK AT THESE DEVICES.
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UPPER MIDWEST WINNERS in 1954 National Lighting Competition for Electrical Contractors are Kenneth A. Johnson (center), Cokato, Minn.; and John O. Kvalsten (right), Minneapolis. Johnson placed second in the residential classification and Kvalsten first in the store and office lighting category. August Eckel, middle west editor of "Electrical Construction & Maintenance," the contest sponsor, presented the certificates and cash awards at the annual meeting of the Minnesota Electrical Association, Inc., in Minneapolis.

tion's new promotional campaign reaches more than 126,000 potential customers. The first ad, appearing in the March 1955 issue, listed the names and telephone numbers of some 42 electrical contractors in as many towns; urged the farmer and homeowner to banish the ghost of inadequate wiring by having his wiring done by a competent electrical contractor; carried the tag slogan "A foot of good wiring is worth a mile of fire hose." In addition, the Association has made available a low-cost tie-in advertising program which members can use in their own localities.

The success of any promotional activity depends to a great extent on the cooperation of contractors and their willingness to sell not only their services but adequate, well-engineered electrical systems. That they can and do sell such jobs was evidenced by entries in the 1954 National Lighting Competition for Electrical Contractors, sponsored by *Electrical Construction & Maintenance*. Prime eligibility requisite was that the contractor initiate the sale of the lighting project entered. Two of the 17 cash award winners were from the Twin City area and received their awards at this meeting. John O. Kvalsten, Kvalsten Electric Co., Minneapolis, won first prize in the Store and Office classification for his installation at the new offices of the Campbell-Mithun, Inc., advertising agency in Minneapolis. Kenneth A. Johnson, Johnson Electric Co., Cokato, Minn. won second place in the residential category for his unique kitchen and dining area lighting installation in the Gilbert Peterson residence in Cokato.

Presentation of certificates and checks was made by August Eckel, middle west editor, *Electrical Construction & Maintenance*, in behalf of the Competition Committee and the Editor and Publisher of EC&M.

The afternoon session of the MEA meeting was devoted to a forum on business management topics. Harry J. Ostlund, retired associate professor, University of Minnesota School of Business, reviewed his activities as Association consultant to develop individual types of special services for member contractors. Among operating cost surveys established was a simplified cost record for trucks.

Virgil A. Hill, Association attorney, discussed legal problems of business management and clarified a number of points on which contractors seemed confused.

Alexander Dean, insurance counselor, emphasized the wisdom of having a comprehensive insurance program covering such items as customer's property in the shop, business interruption, completed operation insurance, non-ownership liability for employees who use their cars on business, fidelity insurance and broad form money security policies.

C. R. Johnson, president, Insured Credit System, Minneapolis, outlined the low-cost method his firm offers to initiate collection of past-due accounts without having the contractor or dealer subscriber enter into the collection activity.

The joint responsibility of management and the estimator in establishing and using accurate cost analyses of electrical installations, in the face of keener competition, was pointed up by August Eckel, middle west editor, *Electrical Construction & Maintenance*. Mr. Eckel strongly urged management to back up the ingenuity and talents of the estimator-engineer by providing the necessary power tools and equipment to facilitate mechanization of field operations. Experience has proved that contractors so organized maintain a definite competitive advantage over firms less disposed to invest in power tools, he noted.

During the business session, the Minnesota Electrical Association, Inc., elected the following officers: President—Wm. A. Ritt, St. Peter; Vice president—Gifford Perry, Austin; secretary—Edward Linner, Stillwater; treasurer—Elroy Lehn, Anoka. Carl A. Birk is manager of the Association. Elected as Directors of the Association for two year terms were: Leo Kemp (Dist. 1), Winona; Milo Miller (Dist. 2), Blue Earth; John Clausen (Dist. 3), Slayton; Vince Dalager (Dist. 4), Morris; Stanley Berquist (Dist. 5), Litchfield; Lee Gray (Dist. 6), North Branch; Bur-

ril Crandall (Dist. 7), Brainerd; Carl Nelson (Dist. 8), Duluth; and L. W. Best (Dist. 9), Thief River Falls.

Other sessions in which contractors participated and attended included a Rural Electric Development Forum at which contractor-dealer Moreau Bailey of Albert Lea discussed inter-industry cooperation. As in the past, the Wiring Codes meeting attracted a full house. Code questions were answered by a panel of experts including, Karl J. Mertz, N.S.P. Co., Minneapolis; Ray Braun, Minnesota State Board of Electricity, St. Paul; Glenn Rowell, electrical engineer, Fire Underwriters Inspection Bureau, Minneapolis; George Jessen, electrical inspector, Winona; and S. Martin Streed, chief electrical inspector, City of Minneapolis.

At an all-industry lighting meeting, contractors were given a comprehensive review of progress in the lighting industry by E. W. Beggs, Lamp Division, Westinghouse Electric Corporation, Bloomfield, N. J. A merchandising session featured recognized sales authorities in the industry. Carl S. Menger, vice president in charge of sales, Triangle Conduit & Cable Co., New Brunswick, N. J., emphasized the industry need for a crusade of confidence; Henry Flarsheim, vice president, Bozell & Jacobs, Chicago, explored sales opportunities; and Howard Farley, business promotion manager, National Electrical Contractors Association, Washington, D. C., outlined NECA's program for developing and promoting more electrical business.



ASKING QUESTIONS about availability of weatherproof 200-amp service equipment for farm wiring are rural electrical contractors (L to R) Bill Smith of Owatonna, Minn., and Matt Raatikka of Sebeka, Minn. Marvin Nabben, agricultural engineer, Northern States Power Co., Minneapolis, demonstrates a 200-amp service switch and self-contained meter cabinet at electrical industry convention; advises them that circuit breaker equipment for underground distribution will soon be available.

McWilliams Honored by Chicago Contractors

A well-earned and deserved tribute to veteran Chicago electrical contractor Arthur C. McWilliams was the highlight of a recent meeting of the Electrical Contractors Association of City of Chicago (Chicago and Cook County Chapter, NECA). The occasion marked the retirement of Mr. McWilliams after 23 years as a member of the executive committee.

"Mac", as he is known to his industry associates, was presented with an Honorary Life Membership in the Association and a beautifully engraved plaque commemorating his valuable contributions to electrical engineering, estimating and ethics in the electrical construction industry.

Mr. McWilliams' efforts to improve industry standards began soon after his graduation from Purdue University in 1902. After working as a dc motor and generator test engineer for the Western Electric Company, he joined the Commonwealth Edison Company in Chicago where he became an estimator for electrical construction work being performed by the utility at that time. He was later associated with the George Cutter Company in South Bend, Ind., as development engineer and plant manager. While with Cutter (later purchased by Westinghouse Electric Company), "Mac" perfected and patented street-lighting equipment.

The next stage of his electrical career was spent with Kohler Brothers, the contracting firm who made the electrical installation at Chicago's Northwestern Station. It was during this period that "Mac" became interested in metering panelboard design and gained national reputation for his work. A majority of the buildings in Chicago's famous Loop were and still are equipped with McWilliams panelboards or later modifications of his original patents. To date, Mr. McWilliams holds more than 65 United States and foreign government patents covering an amazingly diversified list of electrical materials and equipment.

Early in the twenties, Kohler Brothers left the electrical construction field and "Mac" took over that activity. In 1921 he incorporated the McWilliams Electric Company which gained an unsurpassed reputation for the finest type of electrical engineering and installation service. Although he relinquished active operation of the firm in 1951 to Peter G. Shannon, the corporation still bears his name.

Following his business retirement, Mr. McWilliams continued his extracurricular activities in the interest of the electrical construction industry.



A. C. McWILLIAMS (right) receives commemorative plaque and Honorary Life membership in the Electrical Contractors Association of City of Chicago from association president E. E. Leisure, Jr. Presentation was in honor of Mr. McWilliams' contributions to the electrical construction industry.

He is the author of numerous articles in the electric construction trade press covering engineering, design, installation and estimating. Among his latest contributions are a series of "Average Circuit Length" tables developed, with the aid of Chicago electrical contractors, as a practical guide for engineers and electrical contractors to select circuit conductor sizes that provide adequate allowance for voltage drop (EC&M, April 1953, pg. 80). These tables, based on a copper resistance at "operating" temperatures, appear in the appendix of the 1953 revision of the Chicago Electrical Code. In 1953 he worked tirelessly with a committee of electrical contractors to produce a list of "Suggested Graphic Wiring Symbols" to clarify electrical plans. These symbols (EC&M, Dec. 1953, pg. 90) appear in the 1953 Chicago Electrical Code appendix and were submitted for consideration in the proposed revision of the American Standards Assn. electrical symbols.

At their 1954 convention, the National Electrical Contractors Association cited Mr. McWilliams for his outstanding contributions to electrical progress.

Although he has relinquished his chair on the executive committee of the Chicago association, he will continue his activities in the field to which he has given so much of his time and talents. He accepted appointment as permanent chairman of the Codes and Standards Committee of the Chicago Association, a post he has held for more than three decades. He continues as a member of the NECA Codes and Standards Committee and as chairman of the Electrical Industry Task Group for Revision of ASA Standard Z32.9—Graphical Electrical Symbols for Architectural Plans.

BARTH POWERED CABLE PULLER



READ WHAT USERS SAY!

"Our cable puller paid for itself on the first job."

"Biggest thing in electric construction tools in years!"

"Used it nine months and find it a most useful tool."

"Pushes tape into conduit in minutes . . . took hours by hand."

"Saving in tape cost alone soon pays for this tool."

"Particularly effective pushing snake through long runs and bends."

"Paid for itself rapidly in economy of labor and less fatigue."

THE BARTH CABLE PULLER stops automatically if obstructed...may be used in any position . . . the fish tape is always safely inside the conduit or tool, eliminating dangerous contacts

AVAILABLE	General Electric Supply Co.
THRU YOUR	Graybar Electric Co.
NEAREST	Westinghouse Electric Supply Co.

— MAIL COUPON —

THE BARTH CORPORATION

12656 BROOKPARK ROAD • CLEVELAND, OHIO

Send Cable Puller data & prices to:

Company _____

Address _____

Signature _____

Leasure Heads Chicago Contractors

Elmer E. Leasure, Jr., president Monroe Electric Company, was reelected to his seventh consecutive term as president of the Electrical Contractors Association of City of Chicago (Chicago and Cook County Chapter, NECA). Mr. Leasure continues as the Association's representative on the Board of Governors of the National Electrical Contractors Association.

Jack W. Collins, former manager of the Greater Kansas City Chapter, NECA, was re-appointed manager of the Chicago Chapter.

Members of the Executive Committee reelected for another term include: Wm. J. Howe, J. Livingston & Company; Fred Stoeck, Hoffman Electric Co.; L. W. Johnson, Johnson Electric Company; C. P. Walters, Fries-Walters Company; W. W. Giesen, Electrical Contractors, Inc.; T. L. Hanks, Condo Electric Company. Newly elected to the Executive Committee are: W. J. O'Brien, Gallagher-O'Brien Electric Co., Inc.; E. R. Hansen, Meade Electric Co., Inc.; and Chas. A. Gall, Henry Newgard & Company. President Leasure continues as chairman of this committee.

Elected as permanent members of the Executive committee are the following Association past-presidents: Oliver F. Burnett, Jr., Kelso-Burnett Electric Company; and J. Norman Pierce, Pierce Electric Company.

Baraboo Contractors Push Package Wiring

Three electrical contractors in Baraboo, Wis. (population about 7,000), recently took the local problem of inadequate residential electrical service capacity into their own hands and resolved to do something about it. Their solution to the condition is a 100-amp capacity service entrance "package" which they are offering to the homeowner for a flat price of \$99.50, either on a cash or installment basis.

The package, according to James S. Benardis (Benardis Electric) who developed the plan, includes three No. 2 service conductors in conduit; relocation of the meter; ground connection; a distribution panel consisting of two 60-amp parallel, fused pull-out circuits and ten 15-amp plug fuse circuits; plus connection of existing circuits to the new panel.

Pooling their resources and talents with Benardis to promote the deal are Hill Electric, Erv's Electric Shop and Sears Roebuck & Company (who in-



CONTRACTOR J. S. BENARDIS is trying to raise Baraboo, Wis., residential electrical service adequacy standards by offering a 100-amp "package" at a set price. Two other local electrical contractors and Sears' store joined him in the deal.

stalls the major appliances it sells). Although initial advertising costs were handled by this small group, additional promotional aid was soon given by the Wisconsin Power & Light Company whose local newspaper advertising is now pushing this plan and listing the contractors' names.

Effective Feb. 7, the package deal is being offered to the Baraboo residents for a 90-day period. Continuation beyond that time undoubtedly will hinge upon customer acceptance. The contractors admit that the margin on a job of this type, at the offered price, is pretty slim. They are hopeful that, once Baraboo homes are brought up to adequate service standards, additional business in the form of more circuits, rewiring and more appliance sales will be forthcoming.

A. W. Promoters Push Time Payment Rewiring

Residential rewiring and electrical adequacy promotions are making the homeowner rewiring conscious. His former passive attitude is changing to one of interest. The one factor which apparently has done more to bring rewiring business to the electrical contractor is the time payment plan. Now that a customer can pay for wiring as easily as he pays for an appliance or an automobile, he is buying it. The electrical inadequacy barrier is beginning to waver. Package plans concentrating on heavier services are becoming increasingly effective. Additional circuits will come later. Disinterest in wiring adequacy is still evident among a majority of appliance dealers despite the fact that future sales may depend upon the condition of a prospective customer's wiring system.

This was the broad picture presented, through a series of reports and panel discussions to some 380 representatives of wiring promotion groups attending the Eleventh Annual National Adequate Wiring Conference in Chicago, Feb. 24 and 25. The sessions were devoted exclusively to review and discussion of time payment wiring plans, residential wiring standards, farm wiring, electrical modernization of multi-family dwellings, the 1955 Adequate Wiring Program, and national advertising suggestions.

Conference chairman D. B. Clayton, president, National Electrical Contractors Association, opened the session by noting that less than five percent of the homes in this country have wiring systems able to take care of the appliances available today.

A. F. Metz, Chairman of the Board, The Okonite Company, Passaic, N. J. took a "worried" look into the future with respect to the wiring picture. According to statistics, he noted, the electrical appliance industry has set a goal of 428 million appliances to be sold during the next five years. The utility industry continues to expand its present capability of 103 million kilowatts and estimates an average annual residential energy consumption of 5,000 kwhrs by 1963. Metz questioned attainment of these industry goals unless the barrier of inadequate wiring is effectively broken now.

Time-Payment Progress

To date, the most effective way of securing rewiring contracts is to provide the customer with time-payment financing with small monthly payments over 6 to 36 months. At present there are about 25 such programs in operation and more are on the way. In some cases the local utility company handles the financing, and monthly payment is made on a separate invoice or the electric bill. In other cases, financing is handled by banks or other lending agencies with the utility the collecting agency. Some plans require a small down payment, others none. One advantage of all plans is the speed with which customer credit can be cleared. Biggest drawback to date is the long time lapse between customer inquiry and contractor follow-through.

Apartment House Rewiring

In New York and Chicago, multi-family dwelling rewiring is being promoted. J. O. Covington, manager, Adequate Wiring Bureau, Consolidated Edison Co., New York City, reported that 86 apartment buildings have been rewired in a little more than a year. This involved some 3,887 dwelling units in which the average capacity increase was 3.13 kva per unit.



HOME WIRING HUDDLE during session break at National Adequate Wiring Conference in Chicago, finds: (l to r) E. H. Ahlvin, Madison Gas & Electric Co.; G. G. Groesbeck, Madison AW Bureau; and contractor George F. Jacobs comparing Madison, Wis., experience with that of other cities represented at the meeting.

(based on rating of feeder riser to the apartment). Of some 541 apartment buildings surveyed, 78½% were inadequately wired to supply the equipment owner by the tenants, Covington revealed. Apartment rewiring is expensive (can run as high as \$50,000 per building in N. Y.). Tenants must initiate the demand and agree to reasonable rent increases to help the owner recoup his additional costs. With new work, the Bureau succeeded in getting capacity increases of 2.46 kva per dwelling unit above that originally planned in 30 new buildings with a total of 2,006 units, he revealed.

Chicago is also developing an apartment house rewiring program. T. L. Hankins (contractor), co-chairman of the Electric Association Commercial-Industrial Modernization Committee, reported meetings with real estate and building managers committees. Surveys of typical 6, 12, 18, 24 and 36-apartment buildings indicate rewiring would cost from \$290 to \$320 per apartment unit. Chicago apartment rewiring standards include circuit provision in tenant's distribution cabinet for air conditioners based on 1½ watts per square foot of entire building area. Rewiring promotional material for distribution to real estate management firms is now being prepared, Hankins revealed.

New Home Wiring

Adequate wiring in the new home construction field continues to progress. Residential wiring standards have been revised upward. Last year the National Association of Home Builders adopted a voluntary standard of 100-ampere, 3 wire, 110/220 service entrance for new home construction. A number of cities are putting the 100-ampere service standard in their local codes and ordinances. The FHA and other lending agencies are recognizing adequate wiring and increasing home valuations and loans ac-

cordingly. More builders are using certified wiring as a sales point. Adequate wiring should be sold as a quality package with a good price tag, not on a piecemeal circuit basis. These were among the observations made at one of the conference panels.

The 1955 A.W. Program

The Chicago conference marked the introduction of the 1955 Adequate Wiring Campaign. As described by L. E. Barrett, chairman, NAWB Plan Committee, the master promotional package is the "first program in 15 years to cover the entire wiring waterfront." Included in the Master Kit are these seven separate kits:

A Basic Planning Guide for organizing and operating a local adequate wiring program.

Home Wiring Modernization Market sales tools covering installment plan data, plus group and individual promotional materials.

New Home Construction Market folder containing new wiring standards, new certification materials and promotional data.

Electrical Contractor Kit with layout and demonstration aids, advertising mats, and promotional material.

Electrical Dealer Kit with specially designed consumer folders.

Educational Kit with promotional materials for schools, consumer demonstrations and employee training.

National Advertising Kit presenting the NAWB expanded promotional program.

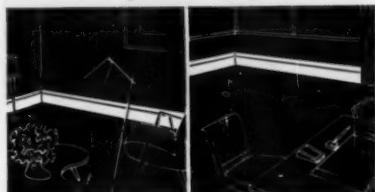
National Adequate Wiring Month

A new nation-wide electrical industry promotion may appear this year in the form of a National Adequate Wiring Month.

Such a united, concentrated barrage of advertising, sales and publicity pressure in behalf of adequate residential wiring was suggested by F. B. McKown, vice president and assistant sales manager, Kennecott Sales Corporation, New York. Prime objective is to sell not only the consumer, but also large segments of the electrical industry on the need for wiring adequacy. Hit them hard and consistently for a 31 day period and you are bound to make a lasting impression.

Specifically, McKown suggested October and the cooperation of every trade, business and profession having a stake in this immense market. As a starter, Kennecott Copper Corporation will cooperate by running two ads in the *Saturday Evening Post* and *This Week* magazine during the month selected, he revealed. McKown's theory, subscribed to by many others at the conference, is that successful wiring promotion must be done at both trade and consumer level and must be supported by the entire electrical industry.

install modern... electric heating for home or office



You can now provide the most modern type of clean, controlled heat in any new or present home or office by installing . . .

CHROMALOX ELECTRIC BASEBOARD HEATERS

Located along *outside* walls, these heaters provide true "perimeter heating" through a combination of radiant and convected heat . . . counteract cold downdrafts . . . insure uniform heat throughout the room or office.

Easy to install . . . in a single room or office, or for a complete installation . . . only two screws to hold it, two wires to connect it.

Easy to control . . . exact temperature in each room or office provided by handy Chromalox wall thermostat.

CHROMALOX ELECTRIC BASEBOARD HEATERS

. . . available in sizes to fit every need . . . approved by Underwriters' Laboratories.

To get complete information on selecting, installing and controlling Chromalox Electric Baseboard Heaters, send in the coupon.

EDWIN L. WIEGAND COMPANY

7637 Thomas Boulevard
Pittsburgh 8, Pa.

Designers and manufacturers of electric heating units exclusively since 1917

Edwin L. Wiegand Company 7637 Thomas Boulevard, Pittsburgh 8, Pa. Please send me Bulletin 801 on Chromalox Electric Baseboard Heaters		A-4434-A
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Company _____		
Street _____		
City _____	Zone _____	State _____



FIRST PRIZE Award in the Residential Lighting classification of Electrical Construction and Maintenance's 1954 Lighting Competition for Electrical Contractors was won by Jerry F. Burt, electrical contractor of Fallbrook, California (center). Certificate and cash prize of \$100 was presented to Mr. Burt by William A. Cyr (left), EC&M's western editorial consultant, during the recent Winter Conference of the Bureau of Home Appliances of San Diego County, San Diego, Calif. Mrs. Burt watches the proceedings approvingly.

Minn. Chapter IAEI Elects New Officers

Members of the Minnesota Chapter, International Association of Electrical Inspectors elected new officers and executive board members at their annual meeting held recently during the Upper Midwest Electrical Industry Convention in Minneapolis.

New president is William L. Semmer, electrical inspector in Minneapolis. Chosen to serve with him in official capacities were the following: first vice president—George Jessen electrical inspector, Winona; second vice president—Floyd Bowers, Mound, Minn.; secretary-treasurer—S. Martin Streed, chief electrical inspector of Minneapolis.

Elected to serve on the Chapter Executive Board were the following electrical inspectors: Stan Sayre, St. Paul; Lewis Layman, Minneapolis; H. P. Adams, St. Paul; John Warkentin, Mountain Lake; and Ray Braun, St. Paul.

J. L. Stair Named IES Medalist for 1955

J. L. Stair, for many years associated with Curtis Lighting, Inc., has been named to receive the 1955 Gold Medal of the Illuminating Engineering Society. This medal, highest honor in the field of illumination, is awarded for "meritorious achievement conspicuously furthering the profession, art or knowledge of illuminating engineering. Presentation of the medal will be made at the Society's Annual

National Technical Conference at its opening session in the Statler Hotel, Cleveland, September 12.

The award of the Medal to Mr. Stair recognizes not only outstanding engineering talent but also a lifetime devoted to the manufacture and application of lighting equipment. In his executive capacity as chief engineer of Curtis Lighting, Inc., and after as consulting engineer, he made many contributions in design of varied lighting equipment, notable lighting installations, speaking and publication activities, training and direction of a competent staff, and devotion to the service and advancement of his profession. The whole pattern of his career is a consistently constructive one, exhibiting the highest professional integrity.

Working closely with the late A. D. Curtis, Mr. Stair, until his retirement in 1948, implemented the desire to make lighting serve in an interesting and superior manner the utilitarian, hygienic, and esthetic requirements of commercial premises and the great variety of public and semi-public buildings. To this end Mr. Stair and his associates made available a wide range of unique equipment competently designed for specific purpose, and applied them in lighting systems planned to meet actual needs and opportunities presented by a given situation. Much creative work went into these solutions, with stimulating effects on lighting practice generally.

Mr. Stair pioneered in the effective presentation of lighting ideas, materials and methods to the architect. The standards he set in this work have never been excelled. He accomplished much for lighting progress in furthering appreciation of illuminating engineering among members of the architectural profession.

Active in the Illuminating Engineering Society for almost 40 years, Mr. Stair has had a continuous record of service in its committees and in the local and national organization. Following two terms as vice-president, he was president of the Society 1933-34.

Mr. Stair's contribution to the technical literature appears in the form of many technical papers published during three decades in the official Transactions of the Society, as well as in a number of reference books. Patented inventions and design patents of reflectors for the control of light and patents granted for the invention of luminaires for incandescent and fluorescent lamps only suggest the wide variety of control equipment and lighting fixture designs for which Mr. Stair is responsible.

The naming of the IES Medalist by the Council of the Illuminating En-

gineering Society is based on the recommendations of a Standing Committee of the Society. The committee includes six of the Society's Past-Presidents and three members-at-large, and operates under official Society procedures and policies. The 1955 Medal Committee was headed by Dr. George S. Crampton, past-president of the Society, who is with the Lenox Instrument Company in Philadelphia.

Home Wiring Gets Boost in Philadelphia

The Philadelphia Electrical Association conservatively estimates that 640,000 existing homes in that city's immediate vicinity are shackled by 2-wire services, inadequate entrance facilities and insufficient circuiting. If brought up to recommended standards this rewiring market could mean \$150-million to contractors. Therefore the Electrical Association is going all-out on a king-sized promotional campaign, making the Electrical Contractor the Key Man in a drive which will extend from March 19 to December 15 of this year.

This campaign will back up the Contractor with a continuous newspaper advertising program, truck decals, car cards, radio and television programs, school presentations, promotional folders and home wiring booklets for prospective customers, direct mail and easy-payment financing



TOP THREE CONTRACTORS in Chicago's Adequate Wiring Certification program receive "Over Hundred" Award Certificates at recent Better Wiring Conference. C. C. Simpson, managing director, Chicago Electric Association, presents award to Barney Nixon, Maron Electric Co., Chicago, who has 350 Certifications. William Veldhouse (second from right), Service Electric Co., Chicago, was a close second and H. M. Brown, Palos Heights, Ill., placed third. The three were among 21 electrical contractors honored at the conference.



MILWAUKEE CONTRACTORS get their just rewards for "placing" in recent Adequate Wiring Contest promoted by the Milwaukee Electrical Contractors Association (Milwaukee Chapter, NECA) adequate wiring committee. Awards, based on greatest number of certifications recorded by the Milwaukee Electric League Adequate Wiring Bureau, consisted of valuable engraved wrist watches and merchandise certificates. Here, William Vincent, Chapter AW committee chairman, presents first prize watch to G. C. Frodermann, A. C. Frodermann & Brothers. Other award recipients are: (L to R) Elwood Findlay, Findlay Electric Co.; Roman Rozmarynowski, Roman Electric Co.; Eugene Fendry, D & F Electric Co.; W. J. Kaiser, Green Tree Electric; John Dilworth, D & F Electric Co. (joint award holder); and Eugene Lombard, Lombard Electric Company.

plans for home owners. Cooperating with the Electrical Association in this effort will be national manufacturers, local distributors, fire insurance underwriters, the Philadelphia Electric Company, banking institutions and savings and loan companies.

Collectively, these groups will promote 100-amp service entrances, at least eight branch circuits in every home, plus the installation of electric space heating, ranges, air conditioners, better lighting, water heaters, dishwashers, clothes dryers and other major appliances. Contractors are also being stimulated by Association-sponsored dinner meetings, sales training conferences, a residential advisory service, wiring handbooks containing ideas and methods for electrical modernization, and a monthly newsletter reporting contractors' progress. Contractors must put up \$15 each to share in this joint promotional venture, but this amount is refunded to each one in full as soon as he can verify the installation of three 100-amp service entrances.

Since conditions in Philadelphia are probably typical of the residential inadequacies in most other major cities, it is the hope of the Association that this campaign will serve as an example for other communities to follow.

Seanger Heads Minn. Inspectors

L. J. Seanger, city electrical inspector, St. Cloud, Minn., was elected president of the Minnesota Electrical Inspectors Association at the annual meeting of that group during the re-

cent Upper Midwest Electrical Industry Convention in Minneapolis. Other officers chosen to serve with Seanger are: first vice president—Orval Westerlin; second vice president—Henry Prottengier, Swanville, Minn.; secretary-treasurer—Glenn Rowell, Minneapolis; assistant secretary-treasurer—Stan Sayre, St. Paul.

Daniel W. Tracy

Daniel W. Tracy, president emeritus of the International Brotherhood of Electrical Workers, AFL, and an Assistant Secretary of Labor from 1940 to 1946, died on March 22 in Washington, D. C. He was 68 years old.

A native of Bloomington, Ill., Mr. Tracy joined the electrical workers union in 1913 while working as a lineman in the Texas-Oklahoma area. He became active in union affairs and was elected business manager of the Houston local soon after becoming a member of the IBEW.

He rose to the international presidency of the organization in 1933, and remained in that position until 1940 when he was named Second Assistant Secretary of Labor by the late President Roosevelt.

He resigned as First Assistant Secretary in 1946 to become labor director of the International Labor Organization, with headquarters in Montreal, and then returned to the IBEW later that year as its president. He was elected to the executive council of the AFL the same year.

He stepped down from the union presidency last April because of ill health.



Full selection from one source . . .

No. 3631 RANGE AND POWER RECEPTACLE, FLUSH MOUNTING. Heavy Bakelite with Patented Swing-away Terminals that prevent dropping or losing of parts. Allows easy one-hand wiring. Polarized for Range and Power Cords. Designed for 4" or 4 11/16" square box. 50 Amps. - 250 V.

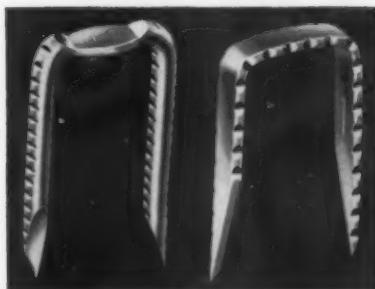
No. 3550 3-WIRE RANGE AND POWER CORSET. All Rubber. 36" Long. Blades are Welded to Wire. No solder is used. One piece molded rubber cap. Includes cable clamp. 50 Amps. - 250 V.

No. 3601-358G STEEL RANGE RECEPTACLE PLATE, SPRAYED BRASS FINISH. Grounded.

No. 3650 RANGE AND POWER RECEPTACLE, SURFACE MOUNTING. Heavy Bakelite with Patented Swing-away Terminals that prevent dropping or losing parts. Allows easy one-hand wiring. Polarized for Range and Power Cords. Heavy steel back plate has knockouts for 3/4", 1", 1 1/4" conduit. Has built-in cable clamp for back or bottom wiring. Complete with mounting screws. 50 Amps. - 250 V.

CIRCLE F MFG. CO.
TRENTON 4, NEW JERSEY

AMAZING *New* CABLE STAPLES



provide up to 67% greater holding power . . . keep cable installations in place and in safe condition

● HOLD-TITES REALLY HOLD TIGHT: New Titchener "Hold-Tite" Cable Staples have barbed edges—to grip the wood and hold firmly. Laboratory tensile tests prove up to 67% greater holding power over same size ordinary staples.

● HOLD-TITE STAPLES KEEP CABLES IN PLACE: Ordinary cable staples often drop out or pull out a few days after they're put in. Sagging cables can be dangerous. Use Hold-Tites—make sure your flexible cable installations, metallic and non-metallic—stay up where they belong.

● WILL NOT BEND: Hold-Tite Staples are made of special analysis steel which doesn't bend or deform—even when hammered into hardest woods. Sharp, even points start straight, go in easily.

● A COMPLETE LINE: Available in six sizes. Four in flat wire ($\frac{1}{8}$ ", 1", $1\frac{1}{8}$ ", $1\frac{3}{8}$ " inside length), two in round wire, E-Z Drive type (1", $1\frac{1}{4}$ " inside length).



Send now for free box of Hold-Tite Staples!

E. H. TITCHENER & CO.
72 Clinton St., Binghamton, N. Y.



NISA PROBLEMS and motor repair shop methods and techniques were subjects before a round table discussion held during the Eastern Regional Conference in Baltimore recently, participated in by G. E. Jones, NISA President of Amarillo, Texas, and Roland Stolzenbach, Roland Electric Co. Baltimore, Md.

NISA News

Public relations is the result of "members' performance," Fred B. Wipperman is quoted as saying in a manual recently issued by American Trade Association Executives. Discussing the subject of developing a public relations program with limited funds, the NISA executive secretary said: "We discuss the question, make suggestions, etc., but primarily we urge better service, better performance by individuals."

Al's Electric Motors, Roseburg, Ore., became State Industrial Motor Service on January 1.

Richard K. Fisher and "Flip" Bashore of Edwin L. Heim Co., Harrisburg, Pa., are new owners of the company, having purchased the interest of Edwin L. Heim who retired on January 1.

On Feb. 9, one of the country's best-known small motor repair shops moved into modern streamlined quarters. The new home of Tennessee Electric Motor Service is indeed a model shop, incorporating, in the words of its owner, H. Ed. Grant, "all the good ideas I have picked up over the years from other shops plus a few I dreamed up myself."

Two long-time employees of Carl Pons, Shreveport, La., Dick Ramsey and Joe Hood, each with 15 years' service, joined their employer as stockholders in a new corporation, Carl Pons Electrical Co., Inc.

Charles F. Crowder, vice-president of H. N. Crowder Jr. Co., Allentown, Pa., a firm he helped organize in 1919, died February 2. He was 73.

Frank W. Willey, "Mr. NISA" to his thousands of friends in the electrical business, retires from Willey-Wray Electric Co., Cincinnati, April 30. "The break is going to be complete" he says.

Director Emeritus of National Industrial Service Association, he is a charter member of the Association and recently completed a history of NISA to be published next month as an extra issue of NISA NEWS.

Frank W. Sloan, who operates his business under his own name in San Diego, is again president of San Diego Chapter. Founder of the group and its president for its first two years, Sloan will be assisted by Harold L. Arnhart, Arnhart Electric Works, San Diego, secretary-treasurer, and Roland L. Pontius, the Electric Motor Service Co., Oceanside, Calif., vice-president.

"Control Applications" was the topic discussed at Great Lakes Chapter's meeting February 28 at Waldron Hotel in Pontiac, Mich.

Quaker City chapter met February 9 at Beck's-on-the-Boulevard and heard J. A. Ruby of the sales development and technical service department of E. I. DuPont de Nemours & Co. discuss Mylar polyester film and B. E. Ely of DuPont's development and service section talk on Teflon (tetrafluoroethylene resin) and its applications in the electrical industry.

Ollie Klemp of Electric Motor Service, West Bend, Wis., is the next president of Wisconsin Chapter of NISA for 1955.

From Walter J. Prise, Queens Electric Motors, Inc., Jamaica, L. I., N. Y.



DALLAS CONTRACTOR W. Ernest Butcher (right), Butcher Electric Service, receives Look Magazine award for best contractor adequate wiring merchandising program featuring article "Watch Your Wiring." Butcher's residential wiring volume last year pushed the quarter-million mark. Fred Bauer, vice president, Cowles Magazine, Inc., makes presentation at National Adequate Wiring Conference in Chicago.

DATES AHEAD

Illuminating Engineering Society—Regional Conferences: **South Pacific Coast**—Statler Hotel, Los Angeles, California, April 14-15; **Pacific Northwest**—Harrison Hot Spring Hotel, Harrison Lake, British Columbia (Canada), April 25-26; **Midwestern**—Edgewater Beach Hotel, Chicago, Illinois, May 2-3; **Canadian**—Mount Royal Hotel, Montreal, Quebec (Canada), May 12-13; **East Central**—Abraham Lincoln Hotel, Reading, Pennsylvania, May 19-20; and **Northeastern**—Fort William Henry Hotel, Lake George, New York, June 10-11.

Chicago Electrical Industry Show—Third biennial exhibit sponsored by the Electric Association of Chicago in cooperation with the Electrical Maintenance Engineers of Chicago, Conrad Hilton Hotel, Chicago, Ill., May 10-12.

Pacific Coast Electrical Association, Inc.—Annual convention, Palace Hotel, San Francisco, Calif., May 11-13.

National Fire Protection Assn.—59th annual convention, Netherland Plaza Hotel, Cincinnati, Ohio, May 16-20.

National Association of Electrical Distributors—47th annual convention, Conrad Hilton Hotel, Chicago, Ill., May 22-25.

National Industrial Service Assn., Inc.—Annual convention, Hotel Statler, Los Angeles, Calif., June 6-10.

Western Plant Maintenance Show—Los Angeles, Calif., July 12-14.

Edison Electric Institute—Annual convention, Los Angeles, Calif., June 13-16.

New York State Association of Electrical Contractors and Dealers, Inc.—Annual convention, Saranac Inn, Saranac Inn, N. Y., June 27-July 1.

Illuminating Engineering Society—National Technical Conference, Statler Hotel, Cleveland, Ohio, September 12-16.

National Association of Electrical Distributors—Pacific Zone, annual convention, Empress Hotel, Victoria, B. C., Canada, September 25-28.

International Association of Electrical Inspectors—Western Section, annual convention, Hotel Nicollet, Minneapolis, Minn., September 26-28.

Electrical Progress Show—Convention Hall, Philadelphia, Pa., September 27-29.

National Electronics Conference—Hotel Sherman, Chicago, Ill., October 3-5.

National Electrical Industries Show—69th Regiment Armory, New York City, October 11-14.

N. J. Council of Electrical Leagues—19th convention, Atlantic City, N. J., October 14-15.

National Electrical Contractors Association—Annual convention, Waldorf-Astoria, New York City, October 31-November 4.

Fifth Industrial Electric Exposition—Hotel Wm. Penn, Pittsburgh, Pa., November 1-3.

National Electrical Manufacturers Assn.—Annual meeting, Traymore Hotel, Atlantic City, N. J., November 14-18.

American Institute of Electrical Engineers—Winter general meeting, Hotel Statler, New York, N. Y., January 30-February 3, 1956.

Independent Electrical Contractors Assn., Inc.—Annual dinner and dance, Hotel Biltmore, New York, N. Y., February 11.

Among the Manufacturers

Headquarters Announcements

Rockbestos Products Corp., New Haven, Conn.—Beauford H. Reeves, president and general manager.

General Electric Co., Schenectady, N. Y.—Edwin E. Parker, general manager of the instrument department.

Hubbard and Co., Pittsburgh, Pa.—J. R. Parsons, assistant to the vice president in charge of production in the electrical materials division plants in Pittsburgh and Chicago; G. D. Billock, vice president and treasurer; C. H. Keen, assistant general sales manager.

Wiremold Co., Hartford, Conn.—D. Hayes Murphy, chairman of the board, J. D. Murphy, president; R. H. Murphy, executive vice president.

Minnesota Mining & Mfg. Co., St. Paul, Minn.—Wilfred W. Wetzel, general manager of magnetic products division; R. V. Holton, general manager of electrical products division.

Edwards Co., Norwalk, Conn.—Albert E. Sharp, vice president of manufacturing.

United States Steel Corp., American Steel & Wire Div., Cleveland, Ohio—Vernon W. Heimberger, manager of electrical product sales.

Sylvania Electric Products Inc., New York, N. Y.—Frank J. Healy, director.

General Electric Co., Bridgeport, Conn.—C. Howard Black, general manager of the construction materials division.

Federal Pacific Electric Co., Newark, N. J.—Joseph C. Langauet, product sales manager for bus duct, trolley duct and related equipment.

Sola Electric Co., Chicago, Ill.—Nelson P. Marshall, general sales manager; Pat J. Morrissey, field sales manager.

Iron Fireman Mfg. Co., Cleveland, Ohio—Wayne F. Strong, president; F. S. Hecox, W. J. O'Neill, C. T.

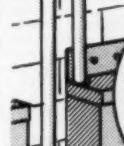
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Burg, E. C. Webb, L. J. Cox, vice presidents.

Robot Appliance, Inc. has opened a new plant in Dearborn, Michigan.

Joy Manufacturing Co., Pittsburgh, Pa.—Louis G. Helmick, Jr., vice president of manufacturing.

Ainsworth Mfg. Corp., Detroit, Mich.—Russell H. Randolph, manager of the Multa-A-Frame Div.

Alpha Wire Corp., New York, N. Y.—Jack Kirschbaum, distributor sales manager.

Duff-Norton Mfg. Co., Pittsburgh, Pa., has purchased the Coffing Hoist Co., of Danville, Ill., which will operate as a division of the parent firm.

General Electric Co., Bloomfield, N. J.—R. D. Roley, Jr., manager of sales and distribution planning; W. L. Sneltjes, manager of modernization and replacement sales; both of the G.E. home heating and cooling dept.

Swartwout Co., Cleveland, Ohio—J. P. Green, director of engineering. Barry Corp., Watertown, Mass., has changed its name to Barry Controls, Inc.

Hubbard and Co., Pittsburgh, Pa., has purchased the pole line hardware operations of the Locke Insulator Co., Baltimore, Md.

National Electric Products Corp., Pittsburgh, Pa.—W. C. Robinson, honorary chairman of the board; A. L. Robinson, chairman of the board; W. C. Robinson, Jr., president; A. L. Robinson, Jr., director and secretary; F. J. Kennedy, assistant to the president; James M. Houston, director.

Jefferson Electric Co., Bellwood, Ill.—Edward J. Bennan, president; Louis J. Cross, chairman of the board.

Minnesota Mining & Mfg. Co., St. Paul, Minn.—Clarence B. Sampair, director.

Okonite Co., Passaic, N. J.—Richard C. Waldron, manager of engineering.

Regional Appointments MIDDLE ATLANTIC

Federal Pacific Electric Co.: Harry Knudson, regional sales manager.

United States Steel Corp., American Steel & Wire Div.: Stanley S. Williams, electrical products representative working out of new Massena, N. Y. warehouse.

Reliance Electric & Engineering Co.: Thomas W. Astle, sales engineer for Buffalo, N. Y. office.

Ward Leonard Electric Co.: New Jersey office has been moved to 511 Millburn Ave., Short Hills.

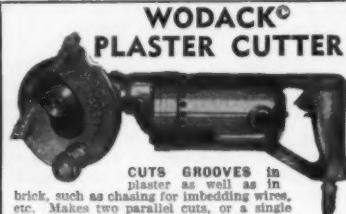
SOUTH ATLANTIC

Pyle-National Co.: Walker & Rosche, Baltimore, Md., representatives.

General Electric Co., Construction Materials Div.: George V. Sheppard

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Equipment, Materials,
Supplies and Services for
Electrical Construction—
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7041 ORCHARD • DEARBORN, MICHIGAN

and James W. Brooks, district representatives for Charlotte, N. C. and Atlanta, Ga.

Steel Electric Products Co., Brooklyn, N. Y.: S. H. Stover, sales representative for West Virginia and part of Pennsylvania.

Line Material Co.: B. E. Adair, field engineer, and E. Bynum, branch manager of new Nashville, Tenn., office at 1503 Laurel St.

EAST CENTRAL

Sylvania Electric Products Inc.: Richard M. Smart, Midwest regional sales engineer.

Jefferson Electric Co.: Robert B. Nieman, district sales representative for Cincinnati, Ohio.

General Electric Co., Construction Materials Div.: James H. Cutter, district representative for Cleveland, Ohio area.

Midland Wire Corp.: Richard B. Taylor, northern sales manager.

United States Steel Corp., American Steel & Wire Div.: Charles H. Eisenhardt, Jr., Cleveland, Ohio, district sales manager; George C. Brandle, director of central area electrical sales.

WEST CENTRAL

Graybar Electric Co.: R. N. Ness, manager at San Antonio, Texas.

Line Material Co.: Dean W. Morill, district lighting manager for the central, north central, mountain states, west coast, and southwest divisions.

General Electric Co., Construction Materials Div.: Paul D. Johnson, north central district representative, with offices at Appleton, Wis.

WEST

Mycalex Corporation of America: Richard H. Hall, commercial engineer for Pacific division, headquarters in Los Angeles, Calif.

Reliance Electric & Engineering Co.: John B. Critchlow, sales engineer for west coast office now located at 128 North B St., San Mateo, Calif.

Swivelier Co., Inc.: H. L. Bargion, manufacturer's representative, Hawaii.

Line Material Co.: New Seattle, Wash., branch is located at 1220 W. Nickerson St. Staff consists of A. G. Simpson and P. B. Holden, field engineers; and C. A. Paynter, branch manager. Another branch opened recently at 360 Shaw Rd., South San Francisco, Calif. Headquartered there will be W. T. Neikirk, district manager; E. M. Stites, field engineer; H. T. Zamzow, apparatus engineer; B. V. Kunde, lighting engineer; H. C. Puls, fibre products engineer; and T. Frost, branch manager. Lighting engineer at the Los Angeles office is now Charles C. Allen.

SEARCHLIGHT SECTION

(Classified Advertising)

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BUSINESS:		

UNDISPLAYED	RATES	DISPLAYED
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Position Wanted undisplayed rate is one-half of above rate, payable in advance.		Individual Spaces with border rules for prominent display of advertisements.
Box Numbered ads \$1.00 per line. New York, Chicago & San Francisco offices count as one additional line. Discount of 10% if full payment is made in advance for 4 consecutive insertions.		The advertising rate is \$1.00 per inch for all basic advertising space, except where a contract basis. Contract rates quoted on request.
New Ads Received by April 22nd at the New York office, 330 W. 42 St., New York 36, N. Y., will appear in the May issue subject to limitations of space available.		An advertising inch is measured $\frac{1}{6}$ vertically on one column. 3 columns— $\frac{3}{6}$ inches—to a page.
		E.C.M.

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Please submit complete resume of education, experience, and salary requirements.

P-5730, Electrical Construction & Maintenance

330 West 42nd St., New York 36, N. Y.

REPLIES (Box No.): Address to office nearest you
NEW YORK: 330 W. 42nd St. (36)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

SELLING OPPORTUNITY OFFERED

AGGRESSIVE REPRESENTATIVE wanted by nationally known manufacturer of a complete line of Fluorescent and Slimline fixtures, including new type Plexi-glass bottom units. Delivers prompt, and competitively priced, territories open in New England, New York, Pennsylvania, Illinois, Michigan, Texas, Florida, Louisiana, etc. RW-5289, Electrical Construction & Maintenance.

SELLING OPPORTUNITY WANTED

CLEVELAND MANUFACTURERS Agent—Sales Engineer, 20 years experience contacting distributors, contractors, utilities, large industries, wants lines preferably conduit boxes, fittings, wire and cables. Address box RA-5813, Electrical Construction & Maintenance.

BUSINESS OPPORTUNITY

For Sale: Electrical Contracting business in Southern Connecticut. Established over 40 years. Enjoys excellent reputation and good accounts. A leading concern in the area. BO-5977, Electrical Construction & Maintenance.

WANTED FOR CANADA

Manufacturers' agent covering leading electrical and hardware wholesalers from coast to coast would like additional line

RA-5964,

Electrical Construction & Maintenance
330 West 42nd St., New York 36, New York

WIRE AND CABLE

Your Best Source

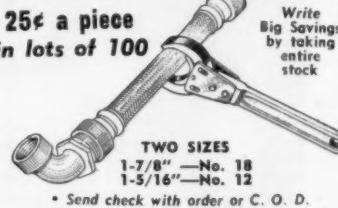
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5000 CONDUIT NUT SPEED WRENCHES

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in lots of 100

Write
Big Savings
by taking
entire
stock



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Send check with order or C. O. D.

L. F. KOCH CO
294 WILMOT AVENUE
BURLINGTON, WISCONSIN

SILICONE INSULATED MOTORS

Here's your opportunity to prove in your own plant at very low cost, that Silicone (Class H) insulated motors pay for themselves many times over in lower maintenance costs; more continuous production. For sale, 2 new Silicone Insulated Westinghouse Crane Motors:

1—15 hp, 1200 rpm, 3 phase 60 cycle, 220 volt, totally enclosed, fan cooled, ball bearing, wound rotor, double shaft crane motor. Frame 326; 100% load for $\frac{1}{2}$ hour, 120 C rise. Our cost \$905.

Sale price \$633.50

1—10 hp, 750 rpm, dc, 230 volt, totally enclosed, fan cooled, ball bearing, double shaft crane motor, 100% load for $\frac{1}{2}$ hour, 100 C rise. Our cost \$1281.50.

Sale price \$897.00

Both motors in original crates. We bought them for export to a company whose import license expired, making it impossible to complete the transaction.

Write Dow Corning Corporation
Attention: C. A. Doremire
Midland, Michigan

BOOKS

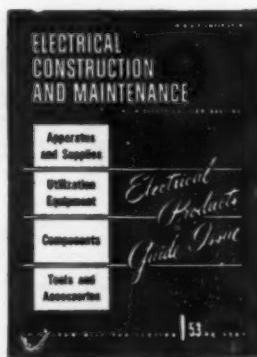
ELECTRICAL CONTRACTORS ESTIMATING HANDBOOK

"A Unique Tool of the Trade"

WRITE FOR DESCRIPTIVE FOLDER TO
THE ESTIMATOR PUBLISHING CO.
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Kenosha, Wis.

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SEARCHLIGHT SECTION

(Classified Advertising)

H. E. Hiltz, Mgr.

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* These manufacturers
advertised their products in
the ELECTRICAL PRODUCTS GUIDE

for time-saving,
money-saving
**POWER
DISTRIBUTION**

**SQUARE D
TOTALLY ENCLOSED FEED-IN DUCT**

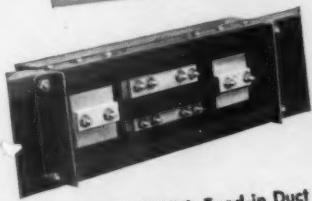
is the most efficient way to transmit large amounts of power. It provides the lowest known voltage drop—only 1.8 volts per 1000 amperes per 100 feet.

Exclusive design requires no ventilation—permits a totally enclosed, compact, dust-excluding enclosure. Rigid construction provides high resistance to heavy electrical stresses.

**SQUARE D
EXPANSION CONNECTED PLUG-IN DUCT**

provides flexible power distribution for branch circuits. Machinery can be rearranged quickly at minimum cost. Plug-in units can be attached at frequent intervals along the length of the duct, providing power where it's needed, when it's needed.

BUSWAY FEATURES PROVE DESIGN LEADERSHIP



NEW JOINT DESIGN. Feed-in Duct joint design saves installation time and reduces maintenance cost. Duct ends are identical—unnecessary to select mating ends before positioning or hanging duct sections. Outward-facing, pre-installed bolts permit rapid assembly and easy maintenance.

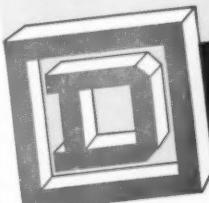


ROUND BUS BARS for Plug-in Duct provide greater mechanical strength and resistance to short-circuit stresses. Circuit breaker or fusible type plug-in units are easily installed at 2-foot intervals along both sides of the duct. Plug-in stabs grip the round bus bars with exceptionally high pressure.



EXPANSION CONNECTORS of laminated copper join bus bars between sections—permit proper alignment, insure tight joints and provide for expansion and contraction at Plug-in duct joints. All bolt heads face outward for greater accessibility.

ASK YOUR ELECTRICAL DISTRIBUTOR FOR **SQUARE D PRODUCTS**



SQUARE D COMPANY

THE SOUTHERN MANUFACTURING COMPANY • CLEVELAND, OHIO • 216-631-1111

Here's what you get in GENERAL ELECTRIC

EASY WIRE PULLING

Baked-on clear Glyptal^{*} coating produces low-friction interior surface that makes wire pulling easy—protects against condensation and most chemical vapors.

NO KINKING OR FLATTENING

Select, high-grade cold-rolled steel used in G-E electrical metallic tubing resists kinking and flattening—makes bending easy.

CORROSION RESISTANCE

Special electrogalvanizing process produces uniform protection...dense, bright zinc coating.

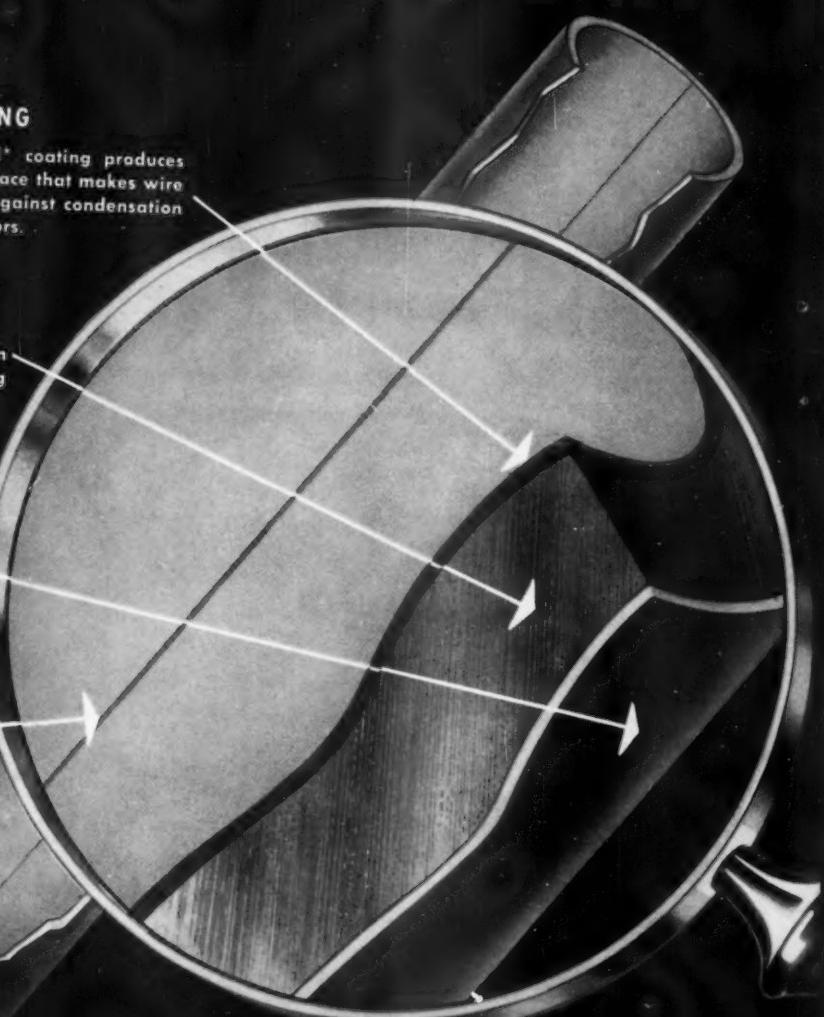
SOLID, SMOOTH SEAM

Only G.E. uses continuous, round bead induction weld. No splits. No burrs to snag or tear insulation.



5 COLORED BUNDLING TAPE INDICATES SIZES

Easier selection—easier handling.
BLACK TAPE— $\frac{1}{2}$ - and 1 $\frac{1}{2}$ -inch
RED TAPE— $\frac{3}{4}$ - and 1 $\frac{1}{4}$ -inch
BLUE TAPE—1- and 2-inch



General Electric EMT speeds wiring jobs and provides protection that will last the lifetime of the building. For more information see your distributor or write Section C54-418, Construction Materials Division, General Electric Company, Bridgeport 2, Connecticut.

*Registered Trade-mark General Electric Company

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GENERAL  ELECTRIC